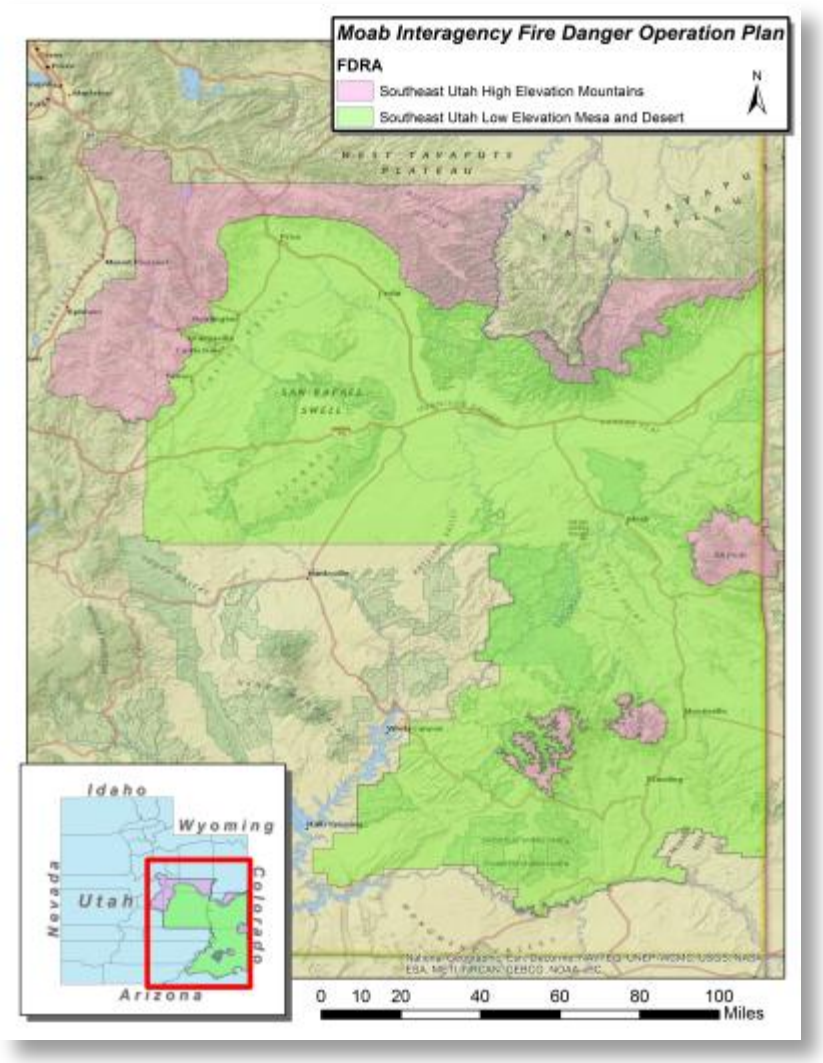
Moab Interagency

Fire Danger Operating and Preparedness Plan

June 2013



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Fire Danger Operating and Preparedness Plan

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I. INTRODUCTION

This plan is intended to document a decision-making process for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters by establishing agency planning and response levels using the best available scientific methods and historical weather/fire data.

An appropriate level of preparedness to meet wildland fire management objectives is based upon an assessment of vegetation, climate, and topography utilizing the National Fire Danger Rating System (NFDRS) modeling. This plan combines an Operating Plan with a Preparedness Plan for the four primary wildland fire management agencies responsible for wildland fire management in Moab (BLM, USFS, NPS, and State).

Guidance and policy for development of a Fire Danger Operating and Preparedness Plan can be found in the *Interagency Standards for Fire & Aviation Operations* (*Red Book*), *Wildland Fire and Aviation Program and Management and Operation Guide* (*Blue Book*), and *Forest Service Manual 5120*.

On July 6, 1994, the South Canyon Fire resulted in the deaths of 14 firefighters in Colorado. In 1995, an Interagency Management Review Team for the South Canyon Fire charged the National Advisory Group for Fire Danger Rating with developing "an implementation plan to improve technical transfer of fire danger technology." On July 10, 2001, four firefighters lost their lives on the Thirtymile Fire in Washington. The Thirtymile tragedy prompted an Accident Prevention Plan which contained specific actions to enhance firefighter safety, including the need to identify thresholds for critical fuels and weather conditions that lead to extreme burning conditions and publishing these on pocket cards for use by firefighters. On July 22, 2003, two firefighters lost their lives in the Cramer Fire in central Idaho. OSHA levied serious violations which included the failure to recognize fire danger thresholds for large fires and respond accordingly. In addition, a remote automated weather station (RAWS) near the fire had not received maintenance and calibration before the start of the fire season. This plan addresses action items identified in these tragic fires by providing the direction necessary to convey fire danger awareness to fire management personnel of escalating fire potential. This awareness is critical when wildland fire danger levels exceed thresholds which may significantly compromise safety and control.

This plan provides the framework for decisions which incorporate fire danger rating. It also outlines procedures for developing seasonal risk analysis and defines fire prevention action items by providing the direction necessary to convey fire danger awareness to fire management personnel of escalating fire potential. This awareness is critical when wildland fire danger levels are at severe thresholds that may significantly compromise safety and control. Furthermore, this document serves as an ***interagency*** example where consistent and effective applications of fire danger decisions will be applied across multiple jurisdictional boundaries.

II. OBJECTIVES

A. Provide a tool for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters to correlate fire danger ratings with appropriate fire business decisions in southeastern Utah.

B. Delineate fire danger rating areas (FDRAs) in Moab with similar climate, vegetation, and topography.

C. Establish an interagency fire weather-monitoring network consisting of Remote Automated Weather Stations (RAWS) which comply with *NFDRS Weather Station Standards* (PMS 426-3).

D. Determine fire business thresholds using the Weather Information Management System (WIMS), National Fire Danger Rating System (NFDRS), FireFamilyPlus software to analyze and summarize an integrated database of historical fire weather and fire occurrence data.

E. Ensure that agency administrators, fire mangers, cooperating agencies, industry/commercial entities, and the public are notified of the potential fire danger.

F. Define roles and responsibilities to make fire preparedness decisions, manage weather information, and brief fire suppression personnel regarding current and potential fire danger.

G. Determine the most effective communication methods for fire managers to communicate potential fire danger to cooperating agencies, industry, and the public.

H. Provide guidance to interagency personnel outlining specific daily actions and considerations at each preparedness level.

I. Identify seasonal risk analysis criteria and establish general fire severity thresholds.

J. Identify the development and distribution of fire danger pocket cards to all personnel involved with fire suppression activities within the Moab Interagency Fire Danger Rating Areas.

K. Identify program needs and suggest improvements for the Fire Danger Operating and Preparedness Plan.

III. INVENTORY AND ANALYSIS

In order to apply a system which will assist managers with fire management decisions, the problems must be inventoried and analyzed to determine the most appropriate management control mechanism which will adequately address the issues.

A. Involved Parties

This plan will affect a wide range of entities. However, these entities can be grouped into three primary categories:

1. **Agency:** Employees of the federal, state, and local governments involved in the cooperative effort to suppress wildland fires. This includes BLM, USFS, NPS, BIA, and State of Utah employees, along with volunteer fire departments.
2. **Industry:** Organizations that either utilize the natural resources or have permits to conduct activities on federal, state, or private lands for commercial purposes. These entities or activities include ranchers, wilderness camps, railroads, mines, timber harvesting, filming, building construction, oil and gas, etc.
3. **Public:** Individuals who use the land for recreational purposes such as off-highway vehicle (OHV) use, camping, hiking, fishing, skiing, firewood gathering, mountain biking or general travel. This group also includes those living within the wildland/urban interface (WUI).

B. Fire Problem Analysis

The following table demonstrates the differences between the target groups (Agency, Industry, and Public). The ability to regulate, educate, or control a user group will be based upon the interface method and how quickly they can react to the action taken. In addition, each action will result in positive and/or negative impacts to the user groups. Consequently, the decision tool which would be most appropriate would depend upon the sensitivity of the target group to the implementation of the action. In selecting a component and/or index, several factors must be considered:

1. **Problem/Issue:** This is the problem specific to the area of concern and includes ignition causes. The problem is "framed" to focus on the wildland fire management issue, such as the point when fire activity becomes a burden to the local suppression forces.
2. **Management Action (Application):** This is the decision(s) which will affect the public, industry, or agency personnel. This includes fire management applications which can be used to formulate decisions regarding the potential issues which have been identified for the specific area. Management actions represent a way to link fire danger information with fire management decisions which affect specific target groups. Consider the appropriate set of decision thresholds to address the issue (i.e., Dispatch Level, Staffing Level, Preparedness Level, Adjective Rating, Public/Industrial Restrictions, etc.).
3. **Target Group:** The group of people commonly associated with the problem (Agency, Industry, or Public).
4. **Degree of Control:** This is a general description of how much control the agencies have over these entities (High $\rightarrow$ Low) and how quickly a target group can respond to management actions.

5. **Communication:** Forms of communication used with the user group (face-to-face, radio, telephone, email, newspaper, television, signing/posting, text-messaging, etc.).
6. **Potential Impacts:** The potential impacts on the target group and the likely consequences of a good (or bad) decision.
7. **Component/Index:** Sensitivity of the NFDRS outputs should be consistent with the ability to react (or communicate) to the target group. Memory and variability of the selected component or index must be understood to appropriately match the task and user group. If a situation where control and ability to communicate with the target group is high, the component and/or index which would be most appropriate should also be highly reactive to changing conditions (i.e., Ignition Component, Spread Component). If the situation was reversed where the control and ability to communicate with the target group is low, the appropriate component and/or index should not vary significantly over time (i.e., Energy Release Component).

Table 1 outlines the differences between the target groups (Agency, Industry and Public). The ability to regulate, educate, or control a user group will be based upon the communication interface method and how quickly they can react to the action taken. In addition, each action will result in positive and /or negative impacts to the user groups. Consequently, the decision tool that would be most appropriate would depend upon the sensitivity of the target group to the implementation of the action.

Table 1: Agency, Public and Industry Interaction Matrix

Involved Party	Action	Controllability	Interface Method	Potential Positive Impacts	Potential Negative Impacts	Decision Tool
Agency	Initial Attack (IA) response	Moderate/High	Radio Telephone Fax E-mail Internet	Successful IA	Accidents/ incidents	Burning Index
	Automatic Dispatch of Initial Attack Resources			Resource(s) effective	Resource(s) not essential for successful IA	Burning Index
	Pre-positioning of Resources			Improved IA capability	Financial Logistical	Energy Release Component
	Suspension of Prescribed Fire Projects			Prevent escaped Rx fires	Missed opportunity to treat fuels	Energy Release Component
	Extended Staffing			Improved IA capability	Financial Logistical	Burning Index & ERC
	Wildland Fire Use			Ecological benefits	Public perception	Energy Release Component
Industry	Chainsaw Restrictions	Low/Moderate	Telephone Mail E-mail Face-to-Face Signs Internet	Fire prevention	Political Financial	Energy Release Component
	ORV restrictions			Fire prevention	Political Financial	Energy Release Component
Public	Campground Closures	Low	Newspaper Television Signs Internet Face-to-Face	Fire prevention	Political Financial	Energy Release Component
	Fuel wood Cutting Restrictions			Fire prevention	Political Financial	Energy Release Component
	Campfire Restrictions			Fire prevention	Political Financial	Energy Release Component
	ORV restrictions			Fire prevention	Political Financial	Energy Release Component
	Debris Burning			Fire prevention	Political Financial	Energy Release Component
	Fireworks			Fire prevention	Political Financial	Energy Release Component

C. Fire Danger Rating Areas

A Fire Danger Rating Area (FDRA) is a geographic area relatively homogenous in *climate*, *vegetation* and *topography*. It can be assumed that the fire danger within a region is relatively uniform. The Moab Interagency Fire Danger Planning Area has two Fire Danger Rating Areas (FDRA's). They are identified as the High Elevation Mountains FDRA and the Lower Elevation Mesa Top and Desert FDRA.

1. Low Elevation Mesa Tops and Desert FDRA

a. Location: The Low Elevation FDRA covers lands located below 7500 feet in elevation north of Interstate 70 and lands generally below 8000 feet south of interstate 70. Mesa tops covered with pinyon-juniper are in the lower elevation FDRA while mesa tops with the predominant cover of ponderosa pine are in the high elevation FDRA. This area is primarily BLM administered land and scattered tracts of private and State land administered by the counties and State. National Park Service land is also in this area.

b. Vegetation: The fuels complex of the Low Elevation FDRA consists of forbs, perennial grasses, western annual grasses, salt desert shrub, sagebrush, pinyon-juniper, and mixed conifer. Most wind driven wildfires typically grow large due to the significant continuity of cheat grass in the area. Although it may appear that NFDRS fuel model A (western annual grass) is the dominant fuel model in this FDRA, it does not necessarily correlate as well as fuel model G with historical fire occurrence. NFDRS fuel model G correlates well with Burning Index for Dispatch Levels and ERC for preparedness levels in this FDRA. Refer to Appendix J for information regarding the FirefamilyPlus analysis.

c. Climate: Hot and dry weather typically dominates the Low Elevation FDRA during fire season. Utah is the second driest state in the nation behind Nevada. The temperatures rise to the high 90's, relative humidity drops to the lower teens, and wetting rain events are scarce. Summer weather patterns that affect the area are westerly and southwesterly flows. Westerly flows generally bring hot and dry air into the region with little or no precipitation. The main concern is when low-pressure systems or upper-level disturbances pass through the area with enough energy and moisture to initiate thunderstorm activity and erratic winds. Fire activity may be infrequent, but the potential for large fire growth is usually quite high. Southwesterly flows typically bring monsoonal moisture into the region. Fire frequency may increase due to additional thunderstorm activity, but fire growth potential could be lower due to increased moisture. Fires in this FDRA are typically in climate class 1 (Arid/Semi-arid).

d. Topography: The Low Elevation FDRA is a mixture of deserts, mesas, and canyons.

e. Fire Occurrence: For the past 20 years (1993 – 2012), this FDRA recorded over 3200 fires and burned over 83,000 acres. Approximately 75% of these were lightning caused and 25% were human caused. The months of June, July and August represent the largest percentage of fire activity (78%).

2. High Elevation Mountains FDRA

a. Location: The High Elevation FDRA covers lands above 7500 feet north of Interstate 70 and lands above 8000 feet south of Interstate 70. It primarily includes USFS administered land, BLM administered land in the Book and Roan Cliffs, and scattered tracts of private/state lands administered by the counties and the State.

b. Vegetation: The fuels complex of the High Elevation FDRA is similar to that of the Low Elevation FDRA except that the area has a greater concentration of 100-hour and 1,000-hour time lag fuels, and also contains a greater density of mixed conifer stands. The occurrence of western annual grasses is much lower. The fires of concern typically occur in steep and remote country where access is a problem. Fuel Model G has been selected to represent this area and the Energy Release Component (ERC) will be used as the NFDRS Index to calculate USFS agency preparedness levels. Refer to the appendix for details regarding the FirefamilyPlus analysis.

c. Climate: The climate class ranges from high desert to alpine forest. Precipitation generally increases with elevation. Lower elevations typically receive 12-15 inches per year with higher peaks receiving up to 60 inches per year. February and April tend to be the wettest months while summer and early fall are typically the driest. Summer temperatures can rise to the 90's at lower elevations and mid-80's at higher elevations. Dominate wind patterns during the fire season are southwest except where modified by local topography. Strong up-canyon winds cause control problems. Relative humidity can drop to the lower teens and occasionally into the single digits. Fires in this FDRA are typically in climate class 2 (Sub humid).

f. Topography: The High Elevation FDRA includes the La Sal, Abajo, Manti, Book Cliff, and Roan Cliff mountain ranges. Its drainages are steep and rocky. The remoteness of this area hinders radio and cellular communication.

g. Fire Occurrence: In the past 20 years (1993 – 2012), this FDRA recorded over 750 fires and burned over 220,000 acres. Together, the Rattle Complex and Diamond Creek Fire burned over 180,000 in June 2002, representing 83% of the acreage burned in the past 20 years. Approximately 90% of these were lightning caused and 10% were human caused. The months of June, July and August represent the largest percentage of fire activity (80%).

Table 2 highlights characteristics for each FDRA, derived from the Weather Information Management System (WIMS) station catalog.

Table 2. FDRA Characteristics

FDRA Characteristics		
Characteristic	Low Elevation	High Elevation
Special Interest Group (SIG)	Flattop Mountain, Bryson Canyon, Big Indian Valley, Kane Gulch	Joe's Valley, Bruin Point, North Long Point, Carpenter Ridge
NFDRS Fuel Models	G (primary), A, H	G (primary), A, H
Slope Class	1 (0-25%)	3 (41-55%)
Climate Class	1 (arid)	2 (semi-arid)
Annual Precipitation	9.3 Inches	22.5 inches
Top Elevation	4000 Feet	11,000 Feet
Acres	7.98 Million	2.04 Million
Green-up Standard (estimate)	15-Apr	15-May
1000 Hr Starting	15	20
KBDI Starting	100	100
Agencies	BLM, NPS, FS, State of Utah	BLM, FS, State of Utah
Large Fires	100	10

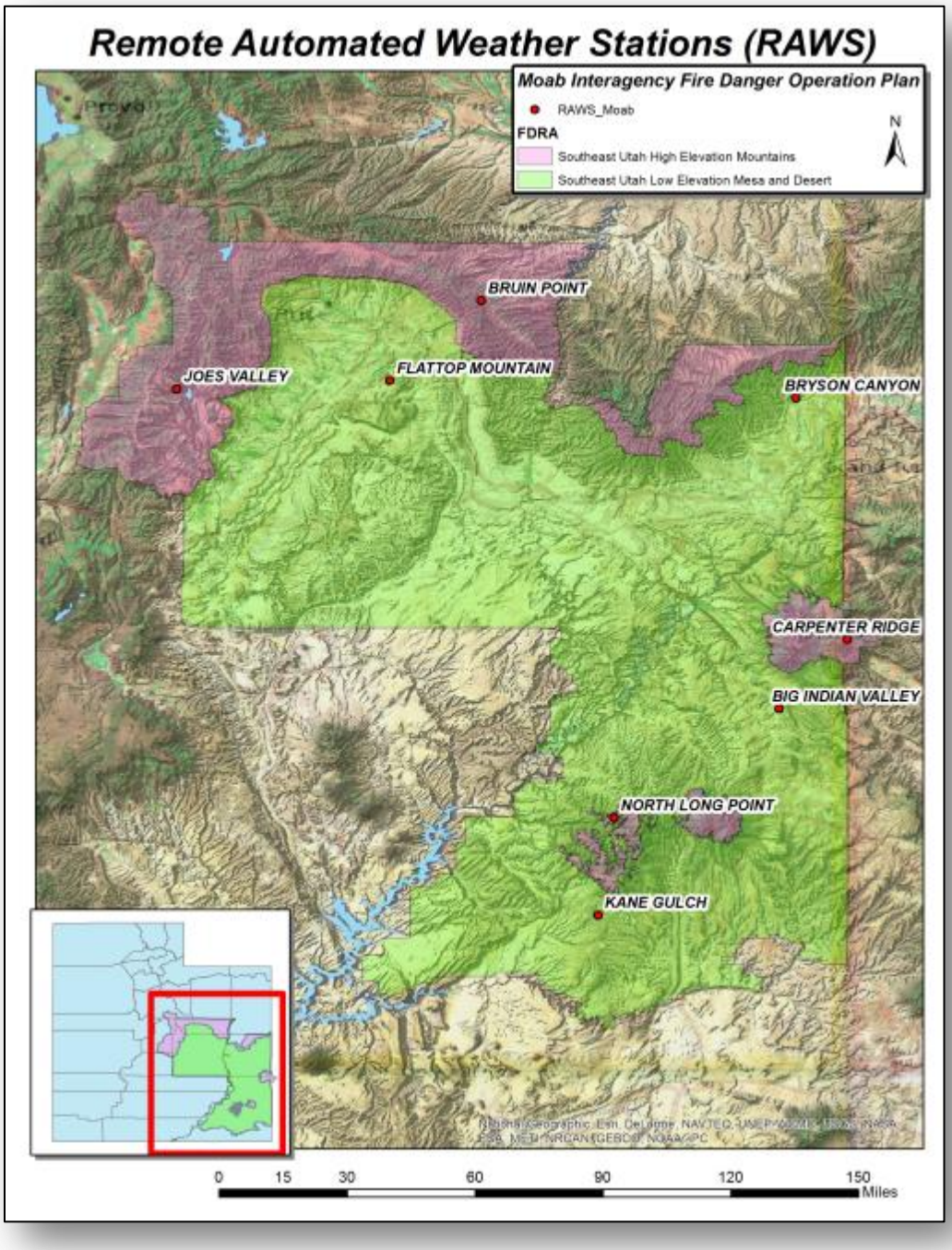
D. Weather Stations

1. Description

Weather is one of the three components that determines fire behavior, and the most variable component, thus it is integral to determining fire danger. For this Plan, weather was analyzed using the data received from eight remote automated weather stations (RAWS) within the Moab Interagency Dispatch Area. The Moab Field Office (BLM) manages five active RAWS: Bruin Point, Bryson Ridge, Flattop Mountain, Big Indian and Kane Gulch. All of these stations comply with NWCG NFDRS Weather Station Standards. The Bryson Ridge, Flattop Mountain, Big Indian and Kane Gulch RAWS have been combined in WIMS as a Special Interest Group (SIG) to compute an equally weighted set of fire danger indices for the low elevation FDRA.

The Manti La Sal National Forest (USFS) manages three active RAWS: Joe's Valley, Carpenter Ridge, and North Long Point. All of these stations comply with NWCG NFDRS Weather Station Standards. The Joe's Valley, Carpenter Ridge, Bruin Point and North Long Point RAWS have been combined as a Special Interest Group (SIG) to compute fire danger indices. This SIG is weighted evenly to reflect years of fire weather collected and statistical goodness of fit with fire business. Refer to Table 3 and the Appendix for a summary of all RAWS, including a description of database alterations and a map of the RAWS locations. Each of these stations complies with NWCG NFDRS Weather Station Standards (*http://www.nwcg.gov/pms/pubs/PMS426-3.pdf*).

2. RAWS Locations and Status (Map)



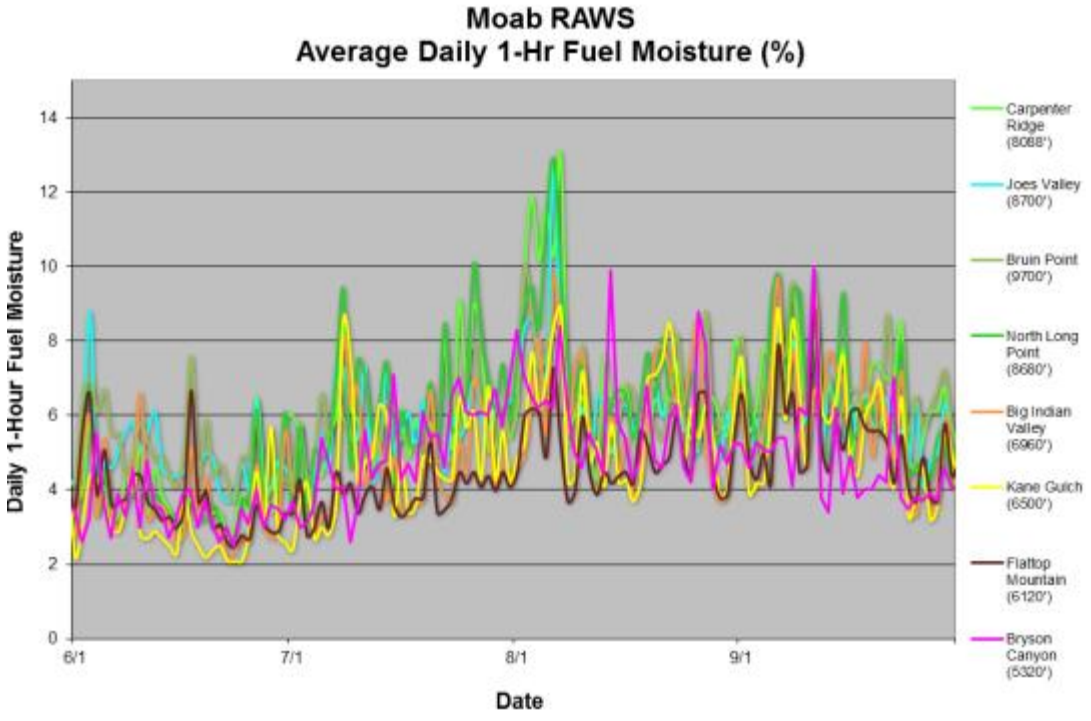
3. RAWS Summary (Table)

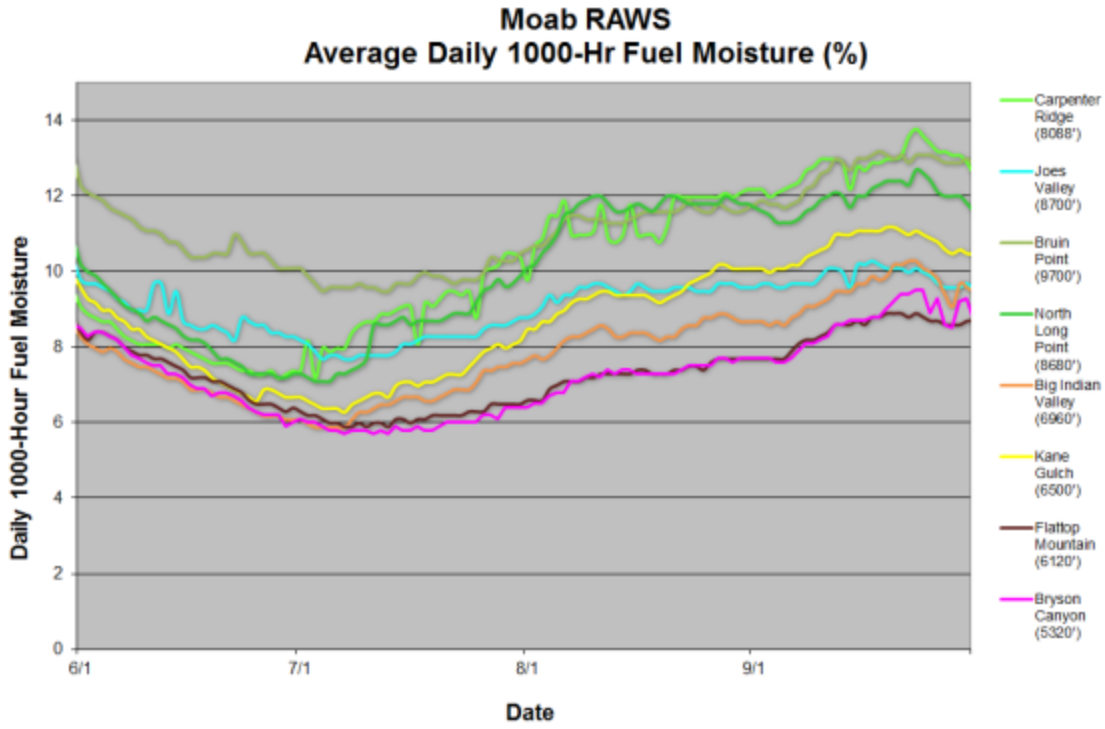
Table 3: RAWS Summary

Station ID	Station Name	Agency/Owner	Data Years	Elevation	Reporting Time
053808	Carpenter Ridge	USFS-UT-MLF	1999 - present	8088	XX:09
421602	Joes Valley	USFS-UT-MLF	1999 - present	8700	XX:20
421702	Bruin Point	BLM-UT-MOD	1988 - present	9755	XX:40
422710	North Long Point	USFS-UT-MLF	1997 - present	8680	XX:39
422102	Bryson Canyon	BLM-UT-MOD	1988 - present	5320	XX:48
422711	Big Indian Valley	BLM-UT-MOD	1988 - present	6960	XX:20
422712	Kane Gulch	BLM-UT-MOD	1991 - present	6500	XX:42
422002	Flattop Mountain	BLM-UT-MOD	1988 - present	6120	XX:17

4. Special Interest Groups (SIGs)

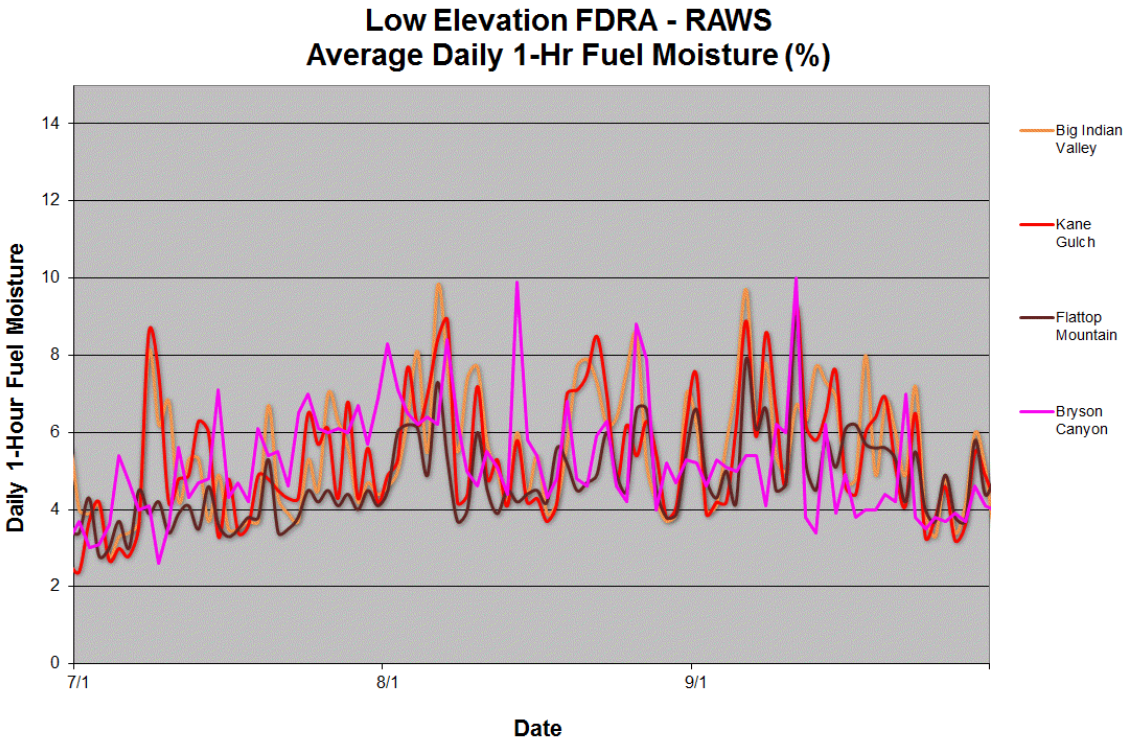
Remote Automated Weather Stations (RAWS) located in different geographical locations with common sensitivity to NFDRS model inputs can be grouped together to form a SIG. A technique developed by Michael Fosberg and William Furman (Fosberg, Furman. 1973) utilizes the 1-hour timelag fuel moisture as the integrator of weather elements to help define fire climate zones. In addition, 1000-hour timelag fuel moisture can be evaluated for dead fuel moisture modeling of heavy fuels in the 3 to 8 inch diameter classification. The following graphics depict the modeling sensitivity using the period of record (data years) listed in Table 3. RAWS with common modeling sensitivity have been grouped into SIGs for each FDRA based upon the following charts graphing each station's relative sensitivity of 1-hour and 1000-hour time-lag fuel moisture.





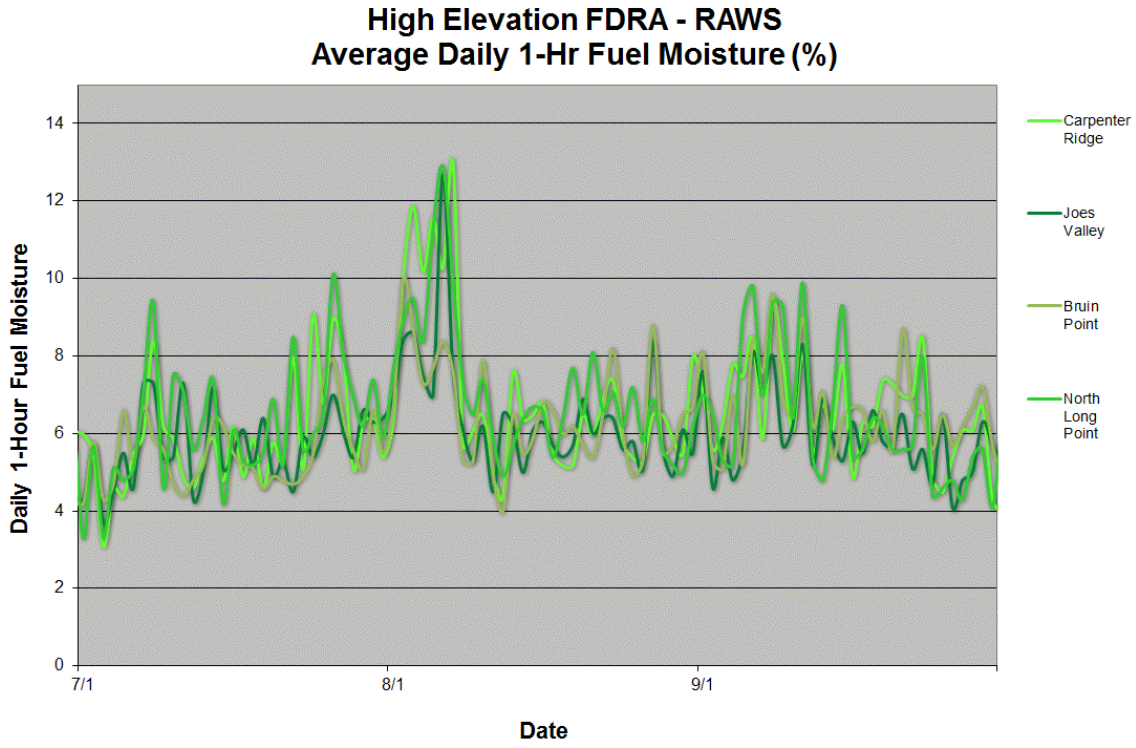
a. Low Elevation Mesa Tops and Desert SIG

The Big Indian, Kane Gulch, Flattop Mountain, and Bryson Canyon RAWS have been combined as a Special Interest Group (SIG) to compute an equally weighted set of fire danger indices for the Low Elevation Mesa Tops and Desert FDRA.

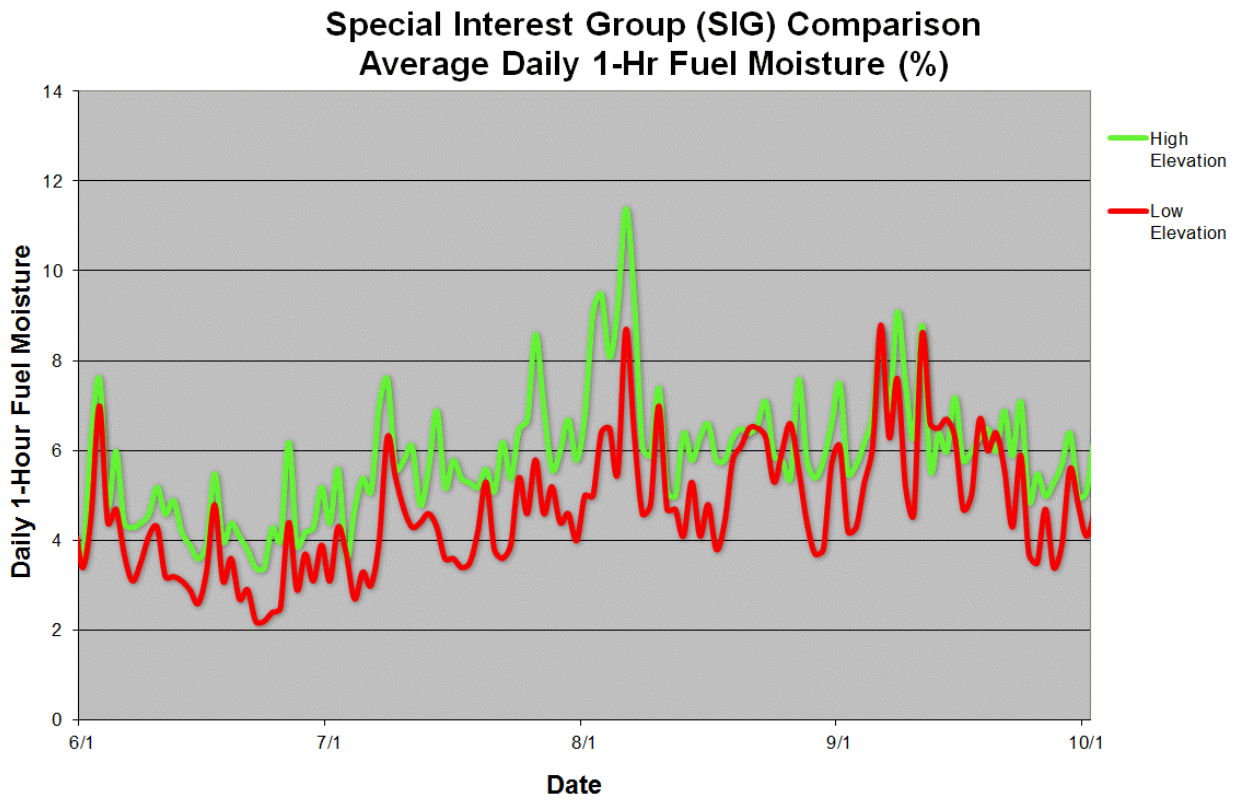


b. High Elevation Mountains SIG

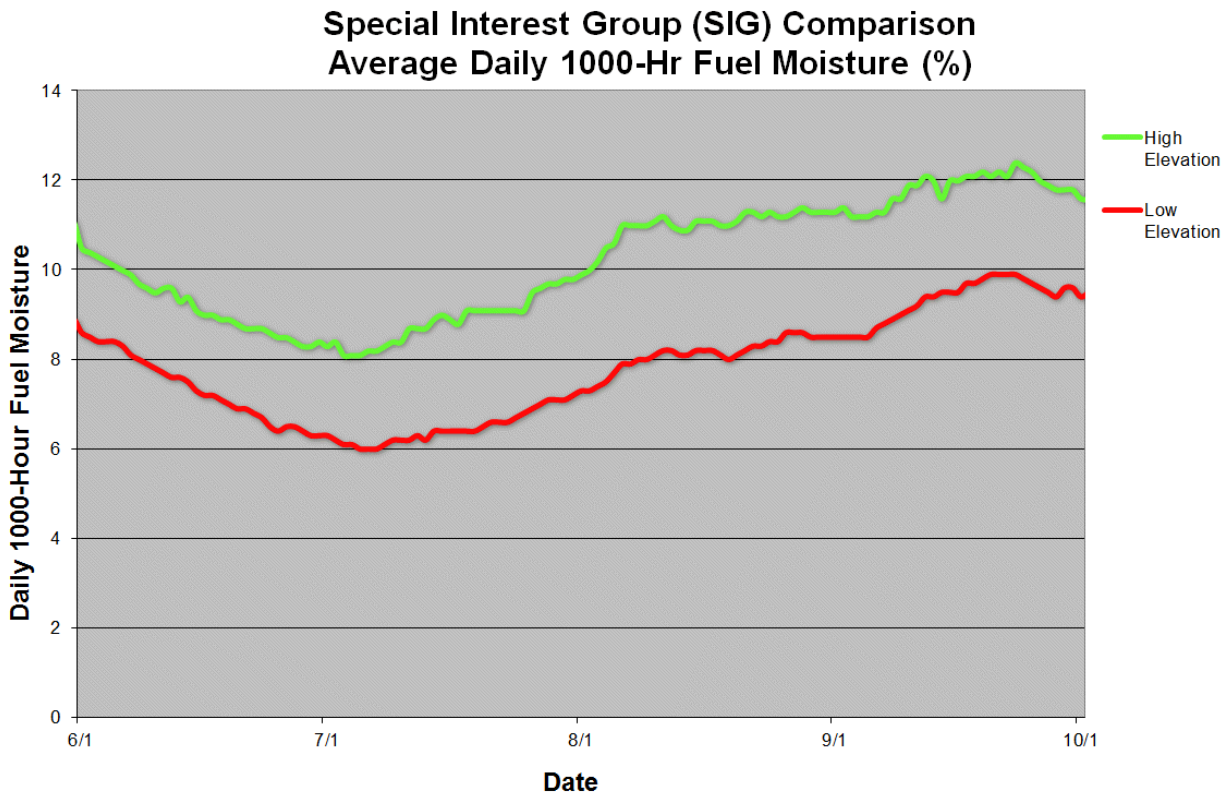
The Carpenter Ridge, Joes Valley, Bruin Point, and North Long Point RAWS have been combined as a Special Interest Group (SIG) to compute an equally weighted set of fire danger indices for the Wasatch Mountain FDRA.



c. 1-hour Fuel Moisture (SIG Comparison)



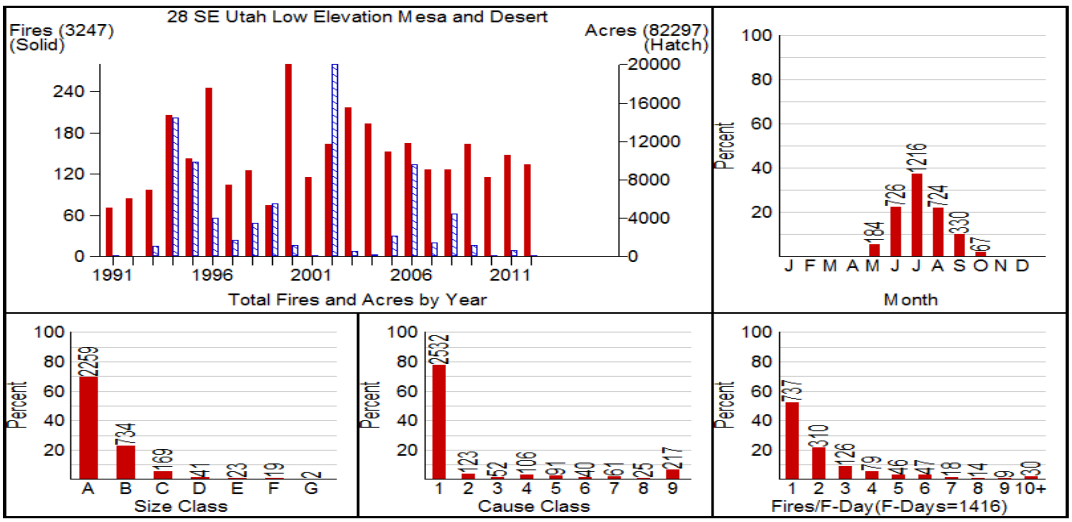
d. 1000-hour Fuel Moisture (SIG Comparison)



E. Fire Occurrence

Department of Interior BLM, NPS, BIA, FWS fire occurrence data was obtained from the *Wildland Fire Management Information* system. Department of Agriculture Forest Service fire occurrence data was obtained from the National Interagency Fire Management Integrated Database (NIFMID) via *Kansas City Fire Access SofTware (*KCFAST). State of Utah data was obtained from their agency database with the assistance of the data steward for the State of Utah. Since all three Departments may have reported the same incidents in their respective databases, duplicate fires were eliminated (to the extent possible) to avoid misrepresentation (skewing) of the statistical correlation with acreage and multiple fire days. FireFamilyPlus software was utilized to produce statistics and graphs. The following fire summary graphs do not differentiate between agencies; fires are depicted without regard to agency affiliation.

1. Low Elevation Mesa Tops and Desert FDRA



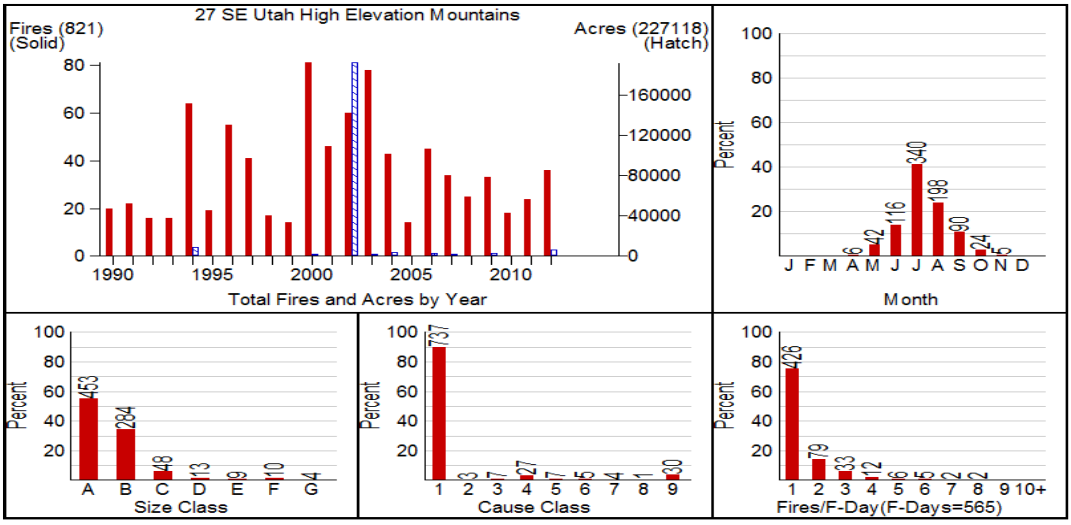
Size Class:

A =	0	—	.25 acres
B =	.30	—	9 acres
C =	10	—	99 acres
D =	100	—	299 acres
E =	300	—	999 acres
F =	1000	—	4999 acres
G =	5000	+	acres

Cause Class:

1 = Lightning	6 =Railroad
2 = Equipment	7 =Arson
3 = Smoking	8 =Children
4 = Campfire	9 =Misc
5 = Debris Burning	

2. High Elevation Mountains FDRA



Size Class:

A =	0	—	.25 acres
B =	.30	—	9 acres
C =	10	—	99 acres
D =	100	—	299 acres
E =	300	—	999 acres
F =	1000	—	4999 acres
G =	5000	+	acres

Cause Class:

1 = Lightning	6 =Railroad
2 = Equipment	7 =Arson
3 = Smoking	8 =Children
4 = Campfire	9 =Misc
5 = Debris Burning	

F. Fire Danger Decision Levels

The NFDRS utilizes the WIMS processor to manipulate weather data and forecasted data stored in the National Interagency Fire Management Integrated Database (NIFMID) to produce fire danger ratings for corresponding weather stations. NFDRS outputs from the WIMS processor can be used to determine various levels of fire danger rating to address the fire problems identified previously in the *Agency, Public and Industry Interaction Matrix*. The system is designed to model worst-case a fire danger scenario. NFDRS will be utilized to produce outputs to assist fire management with three sets of decisions.

- ***Dispatch Levels*** will be used as a decision tool for dispatchers to assign initial attack resources to a fire reported in a specific dispatch zone.
- ***Preparedness Levels*** will assist fire managers with more long-term (or seasonal) decisions with respect to fire danger.
- ***Adjective Fire Danger Rating*** levels are intended to communicate fire danger to the public, such as fire danger signs.

1. Dispatch Level Analysis

Dispatch Levels are established to assist fire managers with decisions regarding the most appropriate response to an initial fire report until a qualified Incident Commander arrives at the incident. The FireFamilyPlus software has been used to establish the Dispatch Level thresholds. A statistical analysis of fire occurrence and historical weather has been completed for each Fire Danger Rating Area (FDRA). The correlation of various combinations of NFDRS outputs with weather records is listed in the appendix. Each agency will utilize the same Dispatch Levels calculated for each FDRA in response to wildland fires in the Moab Interagency Fire Center dispatch area.

Dispatch Level: FireFamilyPlus Analysis Factors and Determinations

FDRA	RAWS		Data Years Used	Weight Factor	Fuel Model	NFDRS Index	Class	Range
	NWS #	Name						
Low Elevation Mesa Tops and Desert	422002 422102 422711 422712	Flattop Bryson Rdg Big Indian Kane Gulch	1991 – 2012 1991 – 2012 1991 – 2012 1991 – 2012	1.0 1.0 1.0 1.0	7G	BI	Low Mod High Extreme	0 – 47 48 – 66 67 – 86 87 +
High Elevation Mountains	421602 421702 053808 422710	Joe's Valley Bruin Pt Carpenter Rdg North Long Pt	1999 – 2012 1999 – 2012 1999 – 2012 1999 – 2012	1.0 1.0 1.0 1.0	7G	BI	Low Mod High Extreme	0 – 43 44 – 54 55 – 64 65 +

2. Preparedness Level Analysis

Preparedness Levels are established to assist fire managers with weekly or monthly planning decisions based upon seasonal fire danger elements. The FireFamilyPlus software has been used to establish the fire business thresholds. A statistical analysis of fire occurrence and historical weather has been completed for each Fire Danger Rating Area. The correlation of various combinations of NFDRS outputs with weather records is listed in the appendix. The final Preparedness Level determination will also incorporate a measure of current and projected levels of resource commitment due to fire activity and a measure of Ignition Risk. Each agency will consider management actions identified in the appendix based upon five local Preparedness Levels.

Preparedness Level: FireFamilyPlus Analysis Factors and Determinations

FDRA	RAWS		Analysis Years Used	Weight Factor	Fuel Model	NFDRS Index	PL Class	Range
	NWS #	Name						
Low Elevation Mesa Tops and Desert	422002	Flattop	1991 – 2012	1.0	7G	ERC	1	0 – 50
	422102	Bryson Rdg	1991 – 2012	1.0			2	51 – 65
	422711	Big Indian	1991 – 2012	1.0			3	66 – 79
	422712	Kane Gulch	1991 – 2012	1.0			4	80 - 91
							5	92 +
High Elevation Mountains	421602	Joe's Valley	1999 – 2012	1.0	7G	ERC	1	0 - 40
	421702	Bruin Pt	1999 – 2012	1.0			2	41 – 56
	053808	Carpenter Rdg	1999 – 2012	1.0			3	57 – 69
	422710	North Long Pt	1999 – 2012	1.0			4	70 – 83
							5	84 +

3. Adjective Fire Danger Ratings

The Adjective Fire Danger Rating will be used by agency personnel to inform the public of the current level of fire danger associated with a specific Fire Danger Rating Area. The amount of interaction will depend on the magnitude of the adjective fire danger. The NFDRS processor (WIMS) will automatically calculate the adjective class rating. MIFC's process for determining local Adjective Fire Danger Ratings will be calculated directly from WIMS. The ERC will be used as the Staffing Index.

4. Climatological Percentiles

Climatological breakpoints are points on the cumulative distribution curve of one fire weather/danger index computed from climatology (weather) without regard for associated fire occurrence/business. For example, the value at the 90th percentile ERC is the climatological breakpoint at which only 10 percent of the ERC values are greater in value. Climatological percentiles were originally developed for budgetary decisions by federal agencies and are predetermined by agency directive, as shown below.

BLM - *80th and 95th percentiles*
FWS - *90th and 97th percentiles*
NPS - *90th and 97th percentiles*
USFS - *90th and 97th percentiles*

It is equally important to identify the period or range of data analysis used to determine the agency percentiles. The percentile values for the calendar year (Jan – Dec) will be different

from the percentile values for the fire season (Jun – Sept). Each agency will have specific (and perhaps different) direction for use of climatological percentiles. This plan supports the use of ***climatological breakpoints (percentiles)*** as decision points for Adjective Fire Danger Rating Levels. However, dispatch and preparedness decisions will be based upon ***fire business thresholds*** determined through a comprehensive statistical analysis of historical weather correlated with fire occurrence data.

IV. OPERATIONS AND APPLICATIONS

Worksheets (flowcharts) will be used to determine the daily dispatch, staffing, preparedness and adjective rating levels. The resultant dispatch and staffing levels for each FDRA will be broadcast in conjunction with the morning information report and documented on the daily resource status report. The Dispatch, Staffing, Preparedness and Adjective Fire Danger Rating levels will also be posted on the MIFC homepage.

Although fire danger ratings do not prevent human-caused fires, a strong effort should be made to communicate the fire danger as it changes throughout the fire season. The social, political, and financial impacts of wildfires on agency, public, and industrial entities can be far reaching. Loss of life, property, and financial resources can potentially be associated with any wildfire. As the fire danger fluctuates, agency personnel need to have pre-planned and appropriate responses. These actions should not only focus on appropriate fire suppression, but also detection and mitigation/education.

A. WIMS Setup and Application

The Weather Information Management System (WIMS) is a comprehensive system that enables users to manage weather information.

WIMS can be accessed at *http://fam.nwcg.gov/fam-web/*.

The WIMS User Guide can be downloaded from the following web site: *http://fam.nwcg.gov/fam-web/pocketcards/wims_ug_final/wims_ug.html*

1. NSIG: Create a Special Interest Groups (SIG)

Enter SIG name (i.e., "Low Elevation") and select Setup

Enter the associated station numbers for the SIG. . . . then select Save

Repeat the steps until all three SIGs have been created.

These SIGs represent the weather station network associated with the three Fire Danger Rating Areas in Moab.

2. EAVG: Assign NFDRS Weighted Avg.

Enter the SIG name and select Display

By default, each station is weighted equally for the first priority fuel model. Keep the default value by selecting Save

If successful, the Display SIG message will be displayed: *Weighted average for SIG 'XXXXX' has been successfully updated.*

Repeat these steps for each SIG.

3. DAVG: Display NFDRS Weighted Averages

Enter the SIG name, Type "O", and current date for daily indices, then select Find

Enter the SIG name, Type "F", and date of forecasted indices, then select Find

The weighted average of fire danger outputs is displayed for the respective SIG.

B. Dispatch Level

Agency personnel use the dispatch level (response level) to assign initial attack resources based on pre-planned interagency "Run Cards." Combined with predefined Dispatch Zones, the Dispatch Level is used to assign an appropriate mix of suppression resources to a reported wildland fire based upon fire danger potential. The dispatch levels are derived from the most appropriate NFDRS index and/or component that correlate to fire occurrence. Burning Index (BI) with NFDRS Fuel Model G has been determined to be the most appropriate NFDRS index that statistically correlates to the potential for large fires to occur. Due to the ability of BI to reflect the most current fire danger potential, and the Dispatch Center's ability to track agency personnel throughout the course of any given day, BI will be computed and implemented for initial attack response levels until a qualified Incident Commander evaluates the need for the dispatched resources.

Dispatch Level Worksheet
Moab Interagency Fire Center

Fire Danger Rating Area (FDRA)	Burning Index (Model G)						
Low Elevation FDRA	00 – 50	51 – 63	64 – 80	81 +			
High Elevation FDRA	00 – 40	41 – 50	51 – 60	61 +			
	⇩	⇩	⇩	⇩			
Preparedness Level	1 – 5	1 – 2	3 – 5	1 – 2	3 – 5	1 – 2	3 -- 5
	⇩		⇩		⇩		⇩
Dispatch Level →	Low		Moderate		High		Extreme

C. Preparedness Level

The Preparedness Level is a five-tier (1-5) fire danger rating system that will be based on Energy Release Component (ERC) and indicators of fire business. The fire business indicators used to calculate the preparedness level include an indication of fire activity, draw-down levels, and a

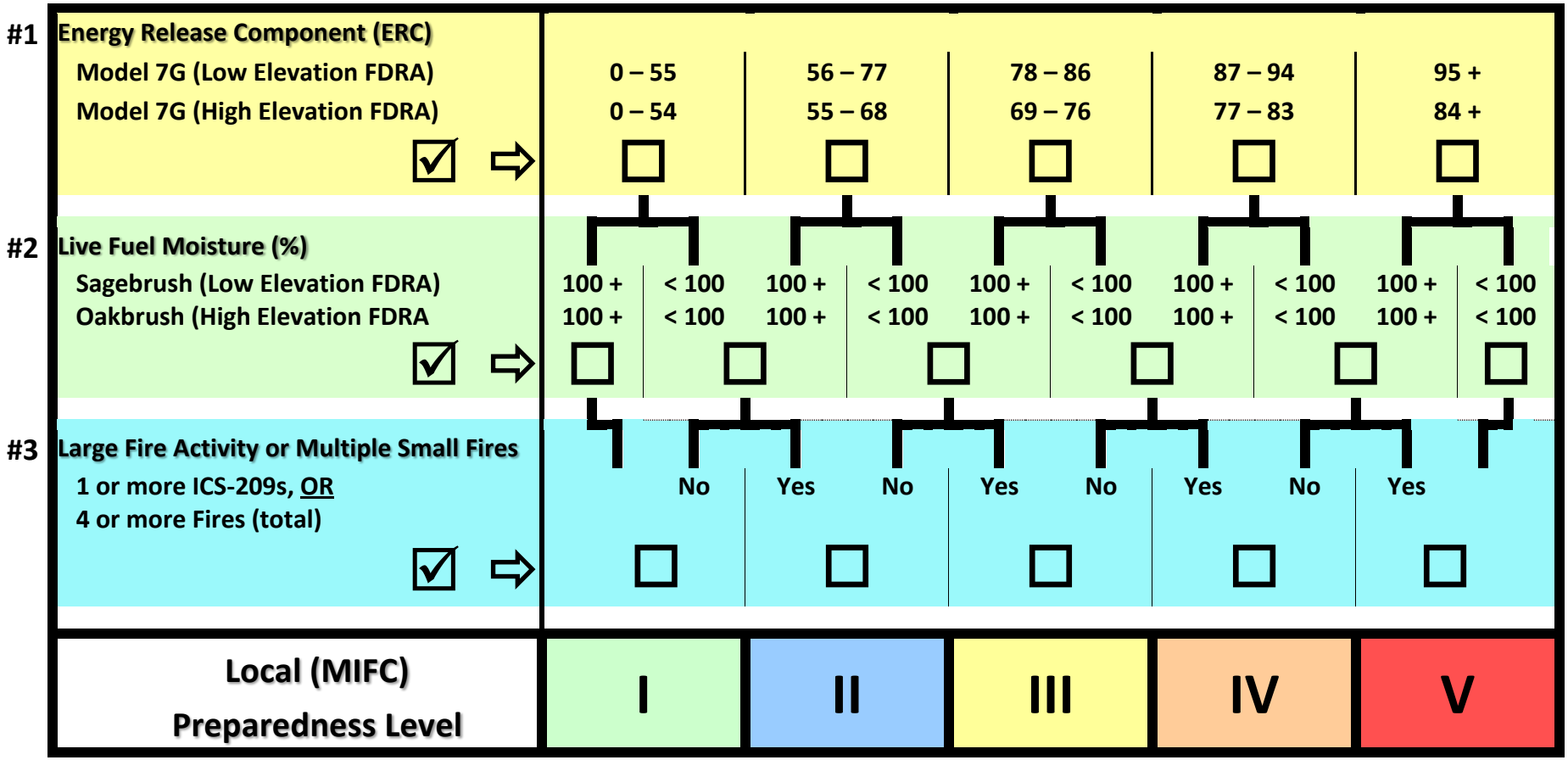
measure of Ignition Risk. Several procedures and guidelines are to be followed and/or considered once the preparedness level has been determined (Appendix G). The thresholds for the preparedness level are set using an historical analysis (FireFamilyPlus) of fire business and its relationship to 1300 (LST) RAWS observations entered into the NIFMID database and processed by WIMS, which calculates the staffing index values (BI, IC, SC, ERC, etc).

Worksheet Instructions:

1. **Staffing Index Value:** Place a checkmark in Row One indicating the appropriate staffing index (Energy Release Component, Fuel Model G). These indices (forecasted by the Salt Lake Weather Office) are based on the 1300 RAWS observations which are input to the WIMS processor by MIFC personnel.
2. **Live Fuel Moisture:** Place a checkmark in Row Two indicating the appropriate Live Fuel Moisture for the associated FDRA. Data can be obtained from the National Fuel Moisture Data (NFMD) Sample Site or the MIFC webpage under Predictive Services (Fuels /National Live Fuel).
   a. **Low Elevation FDRA – Sagebrush LFM:** Average of the most recent samples from the Low elevation Sagebrush sites.
      - **Bryson:**
      - **Kane Gulch:**
   b. **High Elevation FDRA – Gambel Oak LFM:** Average of the most recent samples from the High Elevation Gambel Oak sites.
      - **North Long Point:**
      - **Carpenter Ridge:**
3. **Large Fire Activity or Multiple Small Fires**: Large fire activity will be defined when one or more Incident Status Summaries (ICS-209s) have been (or will be) submitted within the next 12 hour period for incidents managed within the Moab Interagency Dispatch Area (regardless of FDRA). Incident Status Summaries submitted for fires in "monitor" status will not be included; only ICS-209s submitted for incidents which are utilizing local resources will be included in the tally.

   Multiple Small Fires will be defined as 4 or more small fires within the Moab Interagency Dispatch Area (regardless of FDRA).

Local Preparedness Level Worksheet
Moab Interagency Fire Center



D. Adjective Fire Danger Rating

1. Adjective Fire Danger Rating Description

In 1974, the Forest Service, Bureau of Land Management and State Forestry organizations established a standard adjective description for five levels of fire danger for use in public information releases and fire prevention signing. For this purpose only, fire danger is expressed using the adjective levels and color codes described below.

Fire Danger Class and Color Code	Description
Low (L) (Green)	Fuels do not ignite readily from small firebrands, although a more intense heat source such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
Moderate (M) (Blue)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are hit hard and fast while small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn in heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessons.

2. Adjective Fire Danger Rating Determination

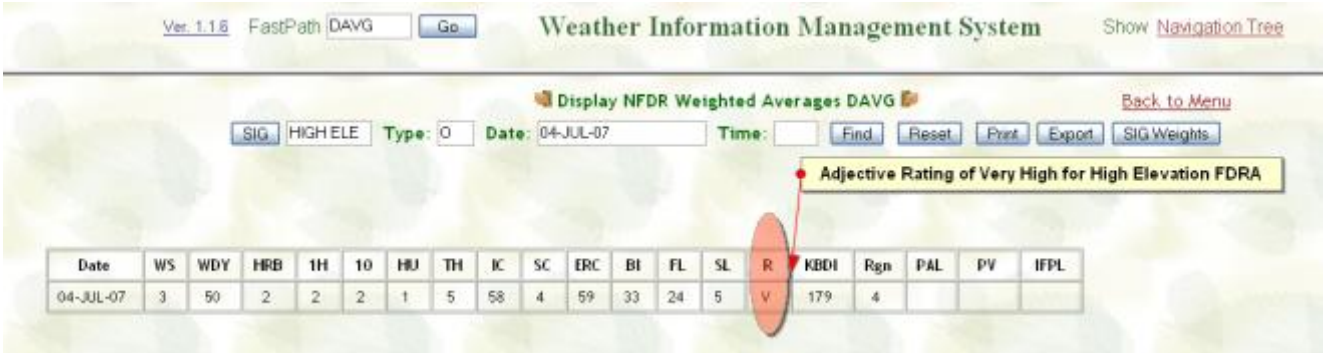
NFDRS processors automatically calculate the adjective class rating. The adjective rating calculations use the staffing index (such as ERC or BI) of the first priority fuel model listed in the station record in the processor.

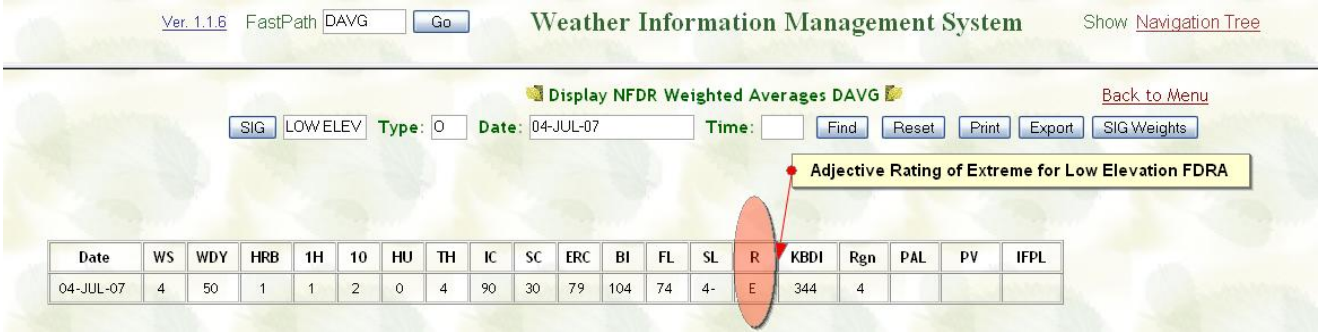
The actual determination of the daily adjective rating is based on the current or predicted value for a user-selected staffing index and ignition component using the following table.

Staffing Levels	Adjective Fire Danger Rating				
1-, 1, 1+	**L**	**L**	**L**	**M**	**M**
2-, 2, 2+	**L**	**M**	**M**	**M**	**H**
3-, 3, 3+	**M**	**M**	**H**	**H**	**VH**
4-, 4, 4+	**M**	**H**	**VH**	**VH**	**E**
5	**H**	**VH**	**VH**	**E**	**E**
Ignition Component	**0-20**	**21-45**	**46-65**	**66-80**	**81-100**

Given the same weather inputs, the NFDRS processor will calculate the adjective fire danger for selected fuel models.

The adjective fire danger rating for the Low Elevation Mesa Tops and Desert FDRA is a weighted average of weather observations between the Big Indian (422711), Bryson Ridge (422102), Flattop Mtn. (422002) and Kane Gulch (422712) RAWS. A Special Interest Group (SIG) has been created in WIMS that combines the data from these four stations using the first priority NFDRS fuel model from each station catalog. The data is accessed using the WIMS "DAVG" command and entering the SIG name in the query box. If a forecasted adjective fire danger rating is required, enter "F" in the "type" query block. The adjective fire danger rating for the High Elevations Mountains is determined by querying the SIG of Joe's Valley (421602), North Long Point (422710), Bruin Point (421702), and Carpenter Ridge (053808) RAWS. The example below displays the forecasted 1300 adjective fire danger (R)ating of (L)ow for July 4th.





3. **Dispatch Level**

   a. **Morning Level** — effective from midnight to 16:00

      Inputs will be taken from the following:

      - *Forecasted* Burning Index (Fuel Model G) issued for that day and available in WIMS by 16:00 the previous day.

   b. **Afternoon Level** — effective from 16:00 to midnight

      Inputs will be taken from the following:

      - *Actual* Burning Index (Fuel Model G) available in WIMS after the observations are edited by 15:15

4. **Preparedness Level**

   a. Daily Preparedness Level — effective from 08:00 (today) to 07:59 (tomorrow)

      Inputs will be taken from the following:

      - *Forecasted* ***Energy Release Component*** (ERC-G) issued for that day and available in WIMS by 16:00 the previous day.
      - ***Live Fuel Moisture*** for the FDRA.
      - ***Large Fire*** Activity (1 or more on-going incidents which require an ICS-209). Or Multiple Small Fires (4 or more fires in the Dispatch area).

5. **Adjective Rating Level**

   a. Daily Adjective Rating Level — effective from 08:00 (today) to 07:59 (tomorrow)

      Inputs will be taken from the following:

      - *Forecasted* ***Energy Release Component*** issued for that day and available in WIMS by 16:00 the previous day.
      - *Forecasted* ***Ignition Component*** issued for that day and available in WIMS by 16:00 the previous day.

6. **Duty Officer Briefing**

   a. Morning Level — text will be sent between 08:30 and 09:00

   b. Afternoon Level — text will be sent between 16:00 and 16:30

E. Seasonal Risk Analysis

Seasonal risk analysis is a comparison of the historic weather/fuels records with current and forecasted weather/fuels information. Seasonal risk analysis is an on-going responsibility for fire program managers. The most reliable indicators of seasonal fire severity have been measurements of fine fuel loading, live fuel moisture, 1000-hour (dead) fuel moisture, and ERC. These levels will be graphically compared to historical maximum values and the average; these graphs will be routinely updated and distributed to fire suppression personnel and dispatch. Seasonal risk analysis information will be used as a basis for pre-positioning critical resources, dispatching resources, and requesting fire severity funding. It has been proven that specific indicators are most useful to predict fire season severity and duration in the High Elevation and Low Elevation Fire Danger Rating Areas.

F. Thresholds (Extreme Fire Danger)

Seasonal risk escalation in fuel complexes of Moab relies upon a combination of factors, which will ultimately trigger an extreme state of fuel volatility and a high potential for large fire growth or multiple ignition scenarios.

1. **Fire Activity:** The occurrence of large/multiple fires is the reliable indicator of severity conditions and the potential for seasonal risk. Any one incident reaching type one or two complexity would be an indicator of severity. Two or more type three incidents within a two to four week period would also be a strong indicator. Three or more initial attack fires in the same day indicate a point where resources are limited. A progressive approach to assessing seasonal risk will prepare the local unit for these occurrences and the necessary resources will already be in place.

2. **Live Fuel Moisture:** Live woody (juniper and pinyon) and herbaceous (sagebrush) fuel moisture plots were established in the vicinity of the Low Elevation RAWS stations in 1997. Since that time, valuable data has been collected and a direct correlation has been drawn between fire intensity (controllability) and live moisture levels. Consequently, fire severity is determined by comparing current trends to historical averages. Live gambel oak samples have been collected at two sites in the High Elevation FDRA (Carpenter Ridge since 2004 and North Long Poing since 2009A mixture of Ponderosa Pine, Serviceberry, Manzanitta, Snowberry, Sagebrush, Quaking Aspen, Douglas Fir and Engleman Spruce samples have been collected at all four High Elevation RAWS sites. Comparison of fuel moisture to historical conditions at various locations within the Utah and surrounding areas can be located on the National Fuel Moisture Database at:
   http://72.32.186.224/nfmd/public/index.php

   a. **Live Fuel Moisture (Sagebrush):** The average herbaceous fuel moisture of sagebrush in the Low Elevation FDRA fluctuates between 200% (May) and 80% (July to August). Readings below 75% indicate increased risk relating to large fire growth and severity conditions. Below average readings may indicate an early or extended fire season.

   b. **Live Fuel Moisture (Gambel Oak):** The average herbaceous fuel moisture of Gambel oak at the High Elevation locations fluctuates between approximately 200% (June) and 85-100% (September/October). Readings below 90% indicate increased risk relating to large fire growth and severity conditions. Below average readings may indicate an early or extended fire season.

3. **NFDRS Thresholds:** ERC and 1000-hr (3" – 8" diameter dead) fuel moisture are used as the primary indicators to track seasonal trends of fire danger potential. NFDRS fuel model G has been chosen due to its good "fit" with the BI and ERC models. Other fuel models which might seem to be more appropriate due to their classification (grass/brush) do not correlate very well statistically with the NFDRS models. Consequently, fuel model **G** was chosen due to its ability to predict fire occurrence; specifically, a day when a large fire is likely to occur. It has been statistically proven that large fire events will occur statistically more often when these thresholds are exceeded. Early and late-season ERC values that trend above average may indicate an extension of the normal fire season.

4. **Weather Thresholds:** Seasonal weather assessments rely upon long-range (30-90 day) forecasts. This information is available in two formats: seasonal long-lead outlooks and 30-90 day outlooks. This information is provided by NOAA Climate Prediction Center. The observable weather factors that contribute to large fires and the potential for extreme fire behavior can be determined from the same percentiles determined from NFDRS thresholds. Any of these factors significantly increase the potential for extreme fire behavior and large fire growth. Combination of these factors will increase the risk.

5. **Drought Indicators:** The Keetch-Byrum Drought Index (KBDI) and Palmer Drought Index track soil moisture and have been tailored to meet the needs of fire risk assessment personnel. Current KBDI information is located on the Wildfire Assessment System (WFAS) Internet site (*http://www.wfas.us/*). Tracking and comparing 1000-hour fuel moisture is another method to assess drought conditions. Palmer Drought Index graphics display current drought conditions while KBDI values of 500-800 indicate the potential for rapid curing and drying of the fine fuels and potential for live fuel moisture to drop. The 1000-hour fuel moisture is also a good drought indicator. Values between below 10 percent indicate the potential risk for extreme burning conditions.

6. **Normalized Difference Vegetation Index (NDVI):** NDVI data is satellite imagery, which displays vegetative growth and curing rates of live fuels. The WFAS Internet site (http://www.wfas.us/) provides several different ways to analyze current and historical greenness imagery, which can be a significant contributor to seasonal risk assessments. An analysis of this imagery will assist in the assessment of current fuel moisture conditions and provide historical as well as average greenness comparisons.

G. Season Ending Event

Historical fire records were examined for both FDRA's to determine the combination of weather parameters that would indicate the end of the fire season. The French Creek WFU in 2007 was used to determine a season ending event in the High Elevation FDRA. The following season-ending events have been identified:

- Low Elevation Mesa Tops and Desert FDRA: three consecutive days when the ERC is less than 40 **and** measurable precipitation has occurred for at least a sum of 12 hours (**or** measurable precipitation has occurred for at least a sum of 25 hours) during that three-day period.
- High Elevation Mountains FDRA: three consecutive days when the ERC is less than 40 **and** measurable precipitation has occurred for at least a sum of 12 hours (**or** measurable precipitation has occurred for at least a sum of 25 hours) during that

three-day period. The amount of precipitation on the French Creek WFU was .25 inches.

Utilizing the Term Module of the Rare Event Risk Assessment Process (RERAP) software, the Weibull waiting-time distribution was developed from historical season-ending dates. Appendix I displays a probability graph along with the *event locator* parameters from the FireFamily Plus software dialog box. From this analysis, it can be estimated that there is an equal probability of a season-ending event occurring before or after the 50th percentile date. For the High Elevation Mountain FDRA, this occurs near October 1st.

H. Fire Danger Pocket Cards

The Fire Danger Pocket Card is a tool which can aid fire suppression personnel to interpret NFDRS outputs and understand local fire danger thresholds for a local area. Pocketcards can relate current NFDRS outputs with the historical average and worst-case values in a specific geographic location. Two interagency fire danger pocketcards were developed for firefighter safety. Burning Index has been chosen as the NFDRS output for Dispatch Level since it represents a measure of fire controllability (Deeming et al. 1978). Energy Release Component has been chosen as the NFDRS output to represent fuel dryness and potential energy of fuel. NFDRS fuel model G was selected for all fire danger rating areas as it provides a good statistical correlation to large fire occurrence. The Moab Interagency Fire Center PocketCards meet NWCG guidelines and are posted on the interagency web site: *http://fam.nwcg.gov/fam-web/pocketcards/*

I. Roles and Responsibilities

1. **Fire Danger Operating and Preparedness Plan:** The Moab Interagency Fire Center (MIFC) Manager will ensure that necessary amendments or updates to this plan are completed. Updates to this plan will be made at least every three years and approved by the line officers (or delegates) from each agency. Revised copies will be distributed to the individuals on the primary distribution list.

2. **Suppression Resources:** During periods when local preparedness levels are High to Extreme, the Fire Management Officers from each agency will strive to achieve the most efficient and effective organization to meet Fire Management Plan objectives. This may require the pre-positioning of suppression resources. The FMO/AFMO from each agency will also determine the need to request/release off unit resources or support personnel throughout the fire season.

3. **Duty Officer:** For the purposes of this plan, the Duty Officer(s) from each agency will be identified to the Moab Interagency Fire Center Manager; daily from May through October. The Duty Officer is designated to provide input and guidance regarding staffing, preparedness and dispatch levels. It is the Duty Officer's role to interpret and modify the daily staffing, preparedness and dispatch levels (if warranted) by extenuating factors not addressed by this plan. Modifications of the preparedness and/or dispatch levels must be coordinated through the Fire Center Manager. The Duty Officer will keep their respective agency's fire and management staff updated (as needed). The BLM, Forest Service, National Park Service and State of Utah will ensure the dispatch center is aware of their respective Duty Officer(s) at all times.

4. **Fire Weather Forecasting:** Daily fire weather forecasts will be developed by the National Weather Service, Salt Lake Fire Weather Forecast Office, and posted on the Internet and in WIMS for the MIFC to retrieve.
5. **NFDRS Outputs and Indices:** The MIFC Manager will ensure that the daily fire weather forecast (including NFDRS indices) is retrieved and that the daily preparedness, dispatch, and adjective levels are calculated and communicated to the appropriate target group.
6. **Risk Analysis Information:** The FMO from each federal agency will ensure that seasonal risk assessments are conducted monthly during the fire season. The risk analysis will include information such as live fuel moisture, 1000-hour fuel moisture, fuel loading, NFDRS (BI/IC/ERC) trends, NDVI imagery, and other pertinent data. This information will be distributed to agency staff and the MIFC Manager. The MIFC Manager, AFMOs, and FMOs will ensure information is posted at fire suppression duty stations.
7. **Weather Station Maintenance:** The Remote Sensing Laboratory located at the National Interagency Fire Center (NIFC) maintains and calibrates the BLM RAWS stations on an annual basis. The BLM Fuels Program Manager and the Moab Interagency Fire Center Manager are qualified as first responders to RAWS malfunctions. The Forest RAWS Coordinator is responsible for maintaining and calibrating the USFS RAWS stations on an annual basis.
8. **WIMS Access, Daily Observations, and Station Catalog Editing:** The Moab Interagency Fire Center Manager is listed as the station owner for the BLM and USFS RAWS. The owner maintains the WIMS Access Control List (ACL). The station owner will ensure appropriate editing of the RAWS catalogs. The MIFC Manager will ensure the timely editing of daily 1300 (LST) weather observations of all stations.
9. **Staffing, Preparedness, Dispatch, and Adjective Level Guidelines:** Each agency's fire management staff along with the MIFC Manager will be responsible for establishing and reviewing the, preparedness, dispatch, and adjective level guidelines every three years (as a minimum).
10. **Public and Industrial Awareness:** Education and mitigation programs will be implemented by the agency Public Information Officers, Law Enforcement Officers, FMOs, AFMOs, Fire Wardens, and Fire Education/Mitigation Specialists based on Preparedness Level Guidelines and direction provided by each agency's FMO and Duty Officer.
11. **NFDRS and Adjective Fire Danger Thresholds:** The FDOP team will review weather and fire data at least every three years (when the FDOP is re-analyzed). The team will ensure that the thresholds reflect the most accurate information with the concurrence of the FMOs.
12. **Fire Danger Pocket Cards:** The FMOs will ensure that pocket cards are prepared at least every two years and are in compliance with NWCG standards. The cards will be distributed to all interagency, local and incoming firefighters and Incident Management Teams (IMTs). The pocket cards will be posted on the MIFC and National Wildfire Coordinating Group (NWCG) pocket card web site (*http://fam.nwcg.gov/fam-web/pocketcards/*). Fire suppression supervisors will utilize pockets cards to train and brief suppression personnel ensuring that they are posted at their respective fire stations.

V. PROGRAM IMPROVEMENTS

A. Modeling

1. Compare the 1- and 10-hour fuel moisture values with the Nelson values to evaluate the differences and future utilization.

B. Training

1. Provide FDOP training to cooperators including county fire wardens, cooperating dispatch centers, and military fire departments.
2. Provide refresher training on fire danger applications and PocketCards, emphasizing the differences between BI, ERC, /Dispatch/Preparedness Levels, and Adjective Fire Danger Rating Levels.
3. Train more personnel as RAWS first responders.
4. Establish local WIMS/NFDRS training courses for agency personnel.
5. Emphasize NFDRS training (S-491) for mid-level fire management personnel and Advanced NFDRS for upper-level fire management personnel.

C. RAWS

1. Find and input missing weather data.
2. Analyze the effect of weighting RAWS within each SIG to better represent the potential fire danger for each FDRA.

D. Technology & Information Management

1. Integrate preparedness level flow chart into a software package.

Appendix A – Team Members

Fire Danger Operating and Preparedness Plan

Leanard Garcia, Fire Management Officer
BLM / Canyon Country Fire Zone

Geoff Wallin, Assistant Fire Management Officer
BLM / Canyon Country Fire Zone

Gayle Sorenson / Forest Fire Management Officer
USFS / Manti-LaSal and Fishlake National Forest

Mickey Smith / South Zone Fire Management Officer
USFS / Manti-LaSal National Forest

Rudy Sandoval / Area Fire Management Officer
State of Utah / Division of Forestry, Fire and State Lands

Clark Maughan / Center Manager
Moab Interagency Fire Center

Jeff Kline / Fire Operations Specialist
BLM / Utah State Office

Appendix B – Primary Distribution List

Name	Title	Agency	Mailing Address	E-mail
Leanard Garcia	FMO	BLM	82 E. Dogwood Moab, Utah 84532	lgarcia@blm.gov
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Harry Barber	District Manager	BLM	82 E. Dogwood Moab, Utah 84532	hbarber@blm.gov
Gayle Sorenson	FFMO	USFS	115 E. 900 N. Richfield, Utah 84701	gsorenson@fs.fed.us
Mickey Smith	ZFMO	USFS	62 E 100 N Moab, Utah 84532	msmith11@fs.fed.us
Brandon Hoffman	ZFMO	USFS	115 W Canyon Road Ferron, Utah 84532	bhoffman@fs.fed.us
Allen Rowley	Forest Supervisor	USFS	115 E. 900 N. Richfield, Utah 84701	arowley@fs.fed.us
Rudy Sandoval	Area FMO	STATE	319 N Carbonville Rd. Suite D Price, Utah 84501	rudysandoval@utah.gov
Tracy Dunford	State FMO	STATE	PO BOX 145703 Salt Lake City, Utah 84114	tracydunford@utah.gov
Steve Underwood	FMO	NPS	PO BOX 8 Mesa Verde, Colorado 81330	steven_underwood@nps.gov
Kevin Moore	Chief Ranger	NPS	2282 S West Resource BLVD Moab, Utah 84532	kevin_moore@nps.gov
Mike Hill	Fire Coordinator	NPS	2282 S West Resource BLVD Moab, Utah 84532	mike_hill@nps.gov
Clark Maughan	Center Manager	MIFC	82 E Dogwood Moab, Utah 84532	cmaughan@blm.gov

The above list indicates key personnel associated with this plan. Copies of the FDOP will also be distributed to Utah Division of Forestry and State Lands mangers, and National Forest Service personnel, National Park Service personnel, military airspace coordinators, military fire departments, and surrounding county cooperators.

Appendix C – Terminology

1-hour Timelag Fuels	The 1-hour fuel moisture content represents the modeled fuel moisture of dead fuels from herbaceous plants or roundwood that is less than one quarter inch in diameter. Also estimated is the uppermost layer of litter on the forest floor.
10-hour Timelag Fuels	Dead fuels consisting of roundwood in the size range of one quarter to 1 inch in diameter and, very roughly, the layer of litter extending from just below the surface to three-quarters of an inch below the surface.
100-hour Timelag Fuels	Dead fuels consisting of roundwood in the size range of 1 to 3 inches in diameter and, very roughly, the forest floor from three quarters of an inch to 4 inches below the surface.
1000-hour Timelag Fuels	Dead fuels consisting of roundwood 3 to 8 inches in diameter or the layer of the forest floor more than about 4 inches below the surface or both.
Adjective Rating	A public information description of the relative severity of the current fire danger situation.
Annual Plant	A plant that lives for one growing season, starting from a seed each year.
Burning Index (BI)	BI is a number related to the contribution of fire behavior to the effort of containing a fire. The BI (difficulty of control) is derived from a combination of Spread Component (how fast it will spread) and Energy Release Component (how much energy will be produced). In this way, it is related to flame length, which, in the Fire Behavior Prediction System, is based on rate of spread and heat per unit area. However, because of differences in the calculations for BI and flame length, they are not the same. The BI is an index that rates fire danger related to potential flame length over a fire danger rating area. The fire behavior prediction system produces flame length predictions for a specific location (Andrews, 1986). The BI is expressed as a numeric value related to potential flame length in feet multiplied by 10. The scale is open-ended which allows the range of numbers to adequately define fire problems, even during low to moderate fire danger.
Climatological Breakpoints	Points on the cumulative distribution of one fire weather/fire danger index without regard to associated fire occurrence/business. They are sometimes referred to as exceedence thresholds.
Duff	The partially decomposed organic material of the forest floor that lies beneath the freshly fallen twigs, needles and leaves. (The F and H layers of the forest soil profile.)
Energy Release Component (ERC)	ERC is a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. Since this number represents the potential “heat release” per unit area in the flaming zone, it can provide guidance to several important fire activities. It may also be considered a composite fuel moisture value as it reflects the contribution that all live and dead fuels have to potential fire intensity. The ERC is a cumulative or “build- up” type of index. As live fuels cure and dead fuels dry, the ERC values get higher thus providing a good reflection of drought conditions. The scale is open-ended or unlimited and, as with other NFDRS components, is relative. Conditions producing an ERC value of 24 represent a potential heat release twice that of conditions resulting in an ERC value of 12.

Equilibrium Moisture Content	The moisture content that a fuel particle will attain if exposed for an infinite period in an environment of constant temperature and humidity. When a fuel particle has reached its equilibrium moisture content, the net exchange of moisture between it and its environment is zero.
Fire Business Thresholds	Values of one or more fire weather/fire danger indexes that have been statistically related to occurrence of fires (fire business). Generally, the threshold is a value or range of values where historical fire activity has significantly increased or decreased.
Fire Danger	The resultant descriptor of the combination of both constant and variable factors that affect the ignition, spread, and control difficulty of control of wildfires on an area.
Fire Danger Continuum	The range of possible values for a fire danger index or component, given a set of NFDRS parameters and inputs.
Fire Danger Rating	A system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an areas protection needs.
Fire Danger Rating Area	A geographic area relatively homogeneous in climate, fuels and topography, tens of thousands of acres in size, within which the fire danger can be assumed to be uniform. Its size and shape is primarily based on influences of fire danger, not political boundaries. It is the basic, on the ground unit for which unique fire danger decisions are made based on fire danger ratings. Weather is represented by one or more NFDRS weather (RAWS) stations.
Fire Weather Forecast Zone	A grouping of fire weather stations that experience the same weather change or trend. Zones are developed by the National Weather Service to assist NWS production of fire weather forecasts or trends for similar stations. Fire weather forecast zones are best thought of as a list of similar-weather stations, rather than an area on a map.
Forb	A non- grass-like herbaceous plant.
Fuel Class	A group of fuels possessing common characteristics. In the NFDRS, dead fuels are grouped according to their timelag (1, 10, 100, and 1000 hr) and live fuels are grouped by whether they are herbaceous (annual or perennial) or woody.
Fuel Model	A simulated fuel complex for which all the fuel descriptors required by the mathematical fire spread model have been supplied.
Fuel Moisture Content	The water content of a fuel particle expressed as a percent of the oven-dry weight of the particle. Can be expressed for either live or dead fuels.
Fuels	Non-decomposed material, living or dead, derived from herbaceous plants.
Green-up	Green-up within the NFDRS model is defined as the beginning of a new cycle of plant growth. Green- up occurs once a year, except in desert areas where rainy periods can produce a flush of new growth more than once a year. Green- up may be signaled at different dates for different fuel models. ***Green-up should not be started when the first flush of green occurs*** in the area. Instead, the vegetation that will be the fire problem (represented by the NFDRS fuel model associated with the weather station) when it matures and cures should be identified. Green-up should start when the majority of this vegetation starts to grow.
Herb	A plant that does not develop woody, persistent tissue but is relatively soft or succulent and sprouts from the base (perennials) or develops from seed (annuals) each year. Included are grasses, forbs, and ferns.

Herbaceous Vegetation Moisture Content	The water content of a live herbaceous plant expressed as a percent of the oven-dry weight of the plant.
Ignition Component (IC)	IC is a rating of the probability that a firebrand will cause a fire requiring suppression action. Since it is expressed as a probability, it ranges on a scale of 0 to 100. An IC of 100 means that every firebrand will cause a fire requiring action if it contacts a receptive fuel.
Keetch-Byram Drought Index (KBDI)	KBDI is a stand-alone index that can be used to measure the effects of seasonal drought on fire potential. The actual numeric value of the index is an estimate of the amount of precipitation (in 100ths of inches) needed to bring the soil back to saturation (a value of 0 is complete saturation of the soil). Since the index only deals with the top 8 inches of the soil profile, the maximum KBDI value is 800 or 8.00 inches of precipitation would be needed to bring the soil back to saturation. The Keetch-Byram Drought Index's relationship to fire danger is that as the index value increases, the vegetation is subjected to increased stress due to moisture deficiency. At higher values, desiccation occurs and live plant material is added to the dead fuel loading on the site. Also, an increasing portion of the duff/litter layer becomes available fuel at higher index values.
Litter	The top layer of the forest floor, typically composed of loose debris such as branches, twigs, and recently fallen leaves or needles; little altered in structure by decomposition. (The layer of the forest soil profile.)
Live Fuels	Naturally occurring fuels whose moisture content is controlled by the physiological processes within the plant. The National Fire Danger Rating System considers only herbaceous plants and woody material small enough (leaves, needles and twigs) to be consumed in the flaming front of a fire.
Moisture of Extinction	The theoretical dead fuel moisture content above which a fire will not spread.
Perennial Plant	A plant that lives for more than two growing seasons. For fire danger rating purposes, biennial plants are classed with perennials.
Roundwood	Boles, stems, or limbs of woody material; that portion of the dead wildland fuel which is roughly cylindrical in shape.
Shrub	A woody perennial plant differing from a perennial herb by its persistent and woody stem; and from a tree by its low stature and habit of branching from the base.
Slash	Branches, bark, tops, cull logs, uprooted stumps, and broken or uprooted trees left on the ground after logging; also debris resulting from thinning or wind storms.
Slope	The rise or fall in terrain measured in feet per 100 feet of horizontal distance measurement, expressed as a percentage.
Spread Component (SC)	SC is a rating of the forward rate of spread of aheadfire. Deeming, et al., (1977), states that "the spread component is numerically equal to the theoretical ideal rate of spread expressed in feet-per-minute". This carefully worded statement indicates both guidelines (it's theoretical) and cautions (it's ideal) that must be used when applying the Spread Component. Wind speed, slope and fine fuel moisture are key inputs in the calculation of the spread component, thus accounting for a high variability from day-to-day. The Spread Component is expressed on an open-ended scale; thus it has no upper limit.

Staffing Index	Adjective rating calculations are keyed off the first priority fuel model listed in your station record in the processor. It uses the staffing index (such as ERC or BI) the user associates with the first fuel model/slope/grass type/climate class combination.
Staffing Level	The basis for decision support for daily staffing of initial attack resources and other activities; a level of readiness and an indicator of daily preparedness.
Surface-Area-to-Volume Ratio	The ratio of the surface area of a fuel particle (in square- ft) to its volume (in cubic-ft). The "finer" the fuel particle, the higher the ratio; for example, for grass this ratio ranges above 2,000; while for a ½ inch diameter stick it is 109.
Timelag	The time necessary for a fuel particle to lose approximately 63 percent of the difference between its initial moisture content and its equilibrium moisture content.
Timelag Fuel Moisture Content	The dead fuel moisture content corresponding to the various timelag fuel classes.
X-1000 Hr Fuel Moisture	X-1000 is the live fuel moisture recovery value derived from the 1000-hr fuel moisture value. It is an independent variable used in the calculation of the herbaceous fuel moisture. The X-1000 is a function of the daily change in the 1000-hour timelag fuel moisture, and the average temperature. Its purpose is to better relate the response of the live herbaceous fuel moisture model to the 1000-hour timelag fuel moisture value. The X-1000 value is designed to decrease at the same rate as the 1000-hour timelag fuel moisture, but to have a slower rate of increase than the 1000-hour timelag fuel moisture during periods of precipitation, hence limiting excessive herbaceous fuel moisture recovery.

Appendix D – WIMS User ID List

User Id	User Name
cmaughan	Clark Maughan
Kathleenwhalen	Katie Whalen
Dawndrake	Duckie Drake
FS7321	Brian Mattox
FS7446	Michelle Hawks
FS7094	Mickey Smith
FS9823	Tyko Issacson
FS7271	Brandon Hoffman

For assistance with passwords you may contact the WIMS help desk at 1-800-253-5559 or 208-387-5290, fax 208-387-5292, email: fire_help@fs.fed.us.

Appendix E – Weather Station Catalogs

(*Active RAWS Only*)

Station	Priority	Model	Slope	Herb Grass Type	Climate Class	Staffing Index	Decision Classes	Staffing Index Breakpoints			
								Low		High	
								SI%	VAL	SI%	VAL
Carpenter Ridge (53808)	1	7G	1	P	2	ERC	5	90	88	97	97
	2	7B	1	P	2	BI	4	90	108	97	132
	3	7F	1	P	2	BI	4	90	74	97	94
	4	7H	1	P	2	ERC	5	90	51	97	56
Bruin (421702)	1	7G	3	P	2	ERC	5	90	79	97	89
	2	7H	3	P	2	ERC	5	90	78	97	88
Joes Valley (421602)	1	7G	3	P	2	ERC	5	90	87	97	98
	2	7H	3	P	2	ERC	5	90	49	97	56
	3	7F	3	P	2	BI	4	90	123	97	148
North Long Point (422710)	1	7G	3	P	2	ERC	5	90	88	97	99
	2	7B	3	P	2	BI	4	90	145	97	170
	3	7F	3	P	2	BI	4	90	103	97	126
	4	7H	3	P	2	ERC	5	90	51	97	57
Flat Top (422002)	1	7G	1	P	1	ERC	5	90	97	97	104
	2	7A	1	A	1	BI	4	90	49	97	61
	3	7H	1	P	1	ERC	5	90	55	97	60
	4	7F	1	P	1	BI	4	90	126	97	155
Bryson (422102)	1	7G	3	P	2	ERC	5	90	97	97	105
	2	7H	3	A	2	ERC	5	90	56	97	60
	3	7T	1	P	1	BI	5	90	109	97	134
	4	7F	1	P	1	BI	5	90	161	97	195
Big Indian (422711)	1	7G	1	P	1	ERC	5	90	95	97	102
	2	7A	1	A	1	BI	4	90	54	97	66
	3	7H	1	P	1	ERC	5	90	55	97	59
	4	7F	1	P	1	BI	4	90	132	97	167
Kane Gulch (422712)	1	7G	1	P	1	ERC	5	90	93	97	101
	2	7A	1	P	1	BI	4	90	50	97	62
	3	7F	1	P	1	BI	4	90	118	97	151

Appendix F – Weather Station Data Analysis

Station	Priority	Model	Slope	Herb Grass Type	Climate Class	Staffing Index	Decision Classes	Staffing Index Breakpoints			
								Low		High	
								SI %	VAL	SI %	VAL
Carpenter Ridge (53808)	1	7G	1	P	2	ERC	5	90	88	97	97
	2	7B	1	P	2	BI	4	90	108	97	132
	3	7F	1	P	2	BI	4	90	74	97	94
	4	7H	1	P	2	ERC	5	90	51	97	56
Bruin (421702)	1	7G	3	P	2	ERC	5	90	79	97	89
	2	7H	3	P	2	ERC	5	90	78	97	88
Joes Valley (421602)	1	7G	3	P	2	ERC	5	90	87	97	98
	2	7H	3	P	2	ERC	5	90	49	97	56
	3	7F	3	P	2	BI	4	90	123	97	148
North Long Point (422710)	1	7G	3	P	2	ERC	5	90	88	97	99
	2	7B	3	P	2	BI	4	90	145	97	170
	3	7F	3	P	2	BI	4	90	103	97	126
	4	7H	3	P	2	ERC	5	90	51	97	57
Flat Top (422002)	1	7G	1	P	1	ERC	5	90	97	97	104
	2	7A	1	A	1	BI	4	90	49	97	61
	3	7H	1	P	1	ERC	5	90	55	97	60
	4	7F	1	P	1	BI	4	90	126	97	155
Bryson (422102)	1	7G	3	P	2	ERC	5	90	97	97	105
	2	7H	3	A	2	ERC	5	90	56	97	60
	3	7T	1	P	1	BI	5	90	109	97	134
	4	7F	1	P	1	BI	5	90	161	97	195
Big Indian (422711)	1	7G	1	P	1	ERC	5	90	95	97	102
	2	7A	1	A	1	BI	4	90	54	97	66
	3	7H	1	P	1	ERC	5	90	55	97	59
	4	7F	1	P	1	BI	4	90	132	97	167
Kane Gulch (422712)	1	7G	1	P	1	ERC	5	90	93	97	101

	2	7A	1	P	1	BI	4	90	50	97	62
	3	7F	1	P	1	BI	4	90	118	97	151

Appendix G – Preparedness Level Actions

The following Preparedness Level actions are guidelines for agency personnel. They are discretionary in nature and usually will require a consensus between agency personnel prior to implementation.

Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
Agency Administrator	Ensure supervisors approve fire availability of staff and notify Duty Officer.	●	●	●	●	●	Agency
	Ensure resource advisors are designated and available for fire assignments.	●	●	●	●	●	Agency
	Evaluate work/rest needs of fire staff.		●	●	●	●	Agency
	Consider need for fire restriction or closures.				●	●	Public Industry
	Provide appropriate political support to fire staff regarding the implementation of preparedness level actions.			●	●	●	Agency Public Industry
	Review and transmit severity requests to the appropriate level.				●	●	Agency
	Issue guidance to respective agency staff indicating severity of the season and increased need and availability for fire support personnel.				●	●	Agency
Fire Staff Officer or FMO	Evaluate season severity data (BI and ERC trends for season, fuel loadings, live FM, drought indices, and long term forecasts).	●	●	●	●	●	Agency
	Evaluate fire staff work/rest requirements.		●	●	●	●	Agency
	Brief agency administrator on burning conditions and fire activity.			●	●	●	Agency
	Review geographical and national preparedness levels and evaluate need to suspend local prescribe fire activities.			●	●	●	Agency
	Ensure Education/Mitigation personnel have initiated media contacts and public notification.				●	●	Public Industry
	Ensure agency staff is briefed on increasing fire activity.				●	●	Agency
	Brief next higher level of fire management on increasing/decreasing fire activity.				●	●	Agency
	Consider fire severity request and pre-positioning of resources including: suppression resources, aerial support, aerial supervision, command positions, dispatch, logistical support, and prevention.				●	●	Agency
	Coordinate with interagency partners the need for fire restrictions or closures.					●	Public Industry
	Request that the Agency Administrator issue guidance to respective agency staff regarding the need for increased fire availability in support positions.				●	●	Agency
	Pre-position a Type 3 organization/Type 2 Team.					●	Agency

Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
Duty Officer	Confirm (or adjust) the Preparedness and Dispatch Levels with the MIFC Manager.	●	●	●	●	●	Agency
	If preparedness level is decreasing, consider releasing pre-positioned and detailed resources.	●	●	●			Agency
	Evaluate work/rest needs of IA crews, dispatchers, & aviation bases.			●	●	●	Agency
	Consider aerial detection flight.				●	●	Agency
	Evaluate need to change or shift duty hours of IA resources.				●	●	Agency
	Evaluate draw-down levels for suppression, command, and oversight positions.				●	●	Agency
	Consider extending staffing beyond normal shift length.				●	●	Agency
	Brief FMO on severity of conditions and consider severity request.				●	●	Agency
	Consider pre-positioning and/or detailing of additional IA resources.				●	●	Agency
	Consider pre-positioning and automatic dispatch of ATGS.				●	●	Agency
	Consider bringing in local IA resources from scheduled days off.				●	●	Agency
	Consider patrols and pre-positioning of local IA resources in high risk areas.				●	●	Agency
	Consider automatic dispatch of helicopter, SEAT and/or heavy air tankers for IA				●	●	Agency
MIFC Manager	Determine and broadcast the morning and afternoon preparedness, dispatch, and adjective fire danger levels to interagency fire personnel.	●	●	●	●	●	Agency
	Evaluate work/rest needs of center staff.			●	●	●	Agency
	If preparedness level is decreasing, consider release of pre-positioned or detailed dispatchers and logistical support personnel.	●	●	●			Agency
	Consult with Duty Officer concerning potential for extended staffing beyond normal shift length.				●	●	Agency
	Consider pre-positioning or detail of off-unit IA dispatchers and logistical support personnel.				●	●	Agency
	Consider discussing activation of local area MAC Group.					●	Agency
	Consider ordering a Fire Behavior Analyst.					●	Agency
	Consult with duty officer and FMO regarding potential need for severity request.				●	●	Agency
	Consider bringing additional dispatch personnel in from scheduled days off.					●	Agency
							Agency
	Consult with Eastern Great Basin Coordination Center (EGBCC) regarding availability of resources at the geographical and national levels.			●	●	●	Agency

Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
Assistant Fire Staff or AFMO	Ensure that roadside fire danger signs reflect the current adjective fire danger rating.	●	●	●	●	●	Public
	Ensure IA crews are briefed on local preparedness level, burning conditions, and availability of IA resources and air support.	●	●	●	●	●	Agency
	Ensure incoming pre-position or detailed personnel are briefed on local conditions.	●	●	●	●	●	Agency
	Evaluate work/rest needs of crews.			●	●	●	Agency
	Increase patrols in camping and recreation areas.				●	●	Public
	Consider suspension of project work away from station.					●	Agency
	Provide duty officer with feedback regarding unique/unexpected fire behavior and severity conditions and the need to increase IA capabilities.				●	●	Agency
Fire Education & Mitigation	Ensure that roadside fire danger signs reflect the current adjective fire danger rating.	●	●	●	●	●	Public
	Initiate press release to inform public/industry of the potential fire danger.				●	●	Public Industry
	Ensure the public and industrial entities are aware of the policy regarding fire trespass investigations for human-caused fires and cost recovery for suppression action.				●	●	Public Industry
	Consider need for increased prevention patrols.				●	●	Public Industry
	Contact local fire chiefs to make them aware of fire danger.				●	●	Agency
	Consider door to door contacts in rural communities or ranch areas.					●	Public Industry
	Post signs and warnings in camp and recreation areas.				●	●	Public
	Consult with FMO regarding severity request and potential need for additional prevention personnel.				●	●	Public Industry
	Consult with AFMO and FMO regarding need for fire restrictions, closures and the need to order a Fire Prevention Team.				●	●	Agency Public Industry

Appendix H – Pocket Cards

Burning Index (Fuel Model G)

Fire Danger PocketCard

Moab Interagency Fire Center

http://fam.nwcg.gov/fam-web/pocketcards/

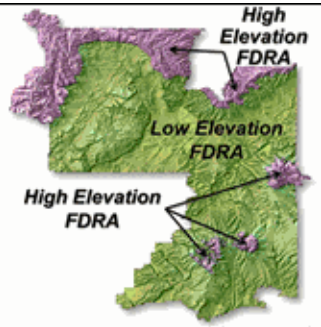
Fire Danger Interpretation

Dispatch Levels	Burning Index - Model G	
	LOW Elevation	HIGH Elevation
Extreme: *Spotting, torching, fire whirls, and crown fire likely. Expect extreme difficulty with containment.*	87 + (84th percentile)	65 + (80th percentile)
High: *Potential for high to extreme intensity. Expect high rates of spread, flame length, and control difficulty.*	67 - 86	55 - 64
Moderate: *Anticipate moderate fire intensity. The BI can change rapidly with variable weather conditions.*	48 - 66	44 - 54
Low: *Expect low fire intensity. Containment should be attainable. However, always be cautious.*	0 - 47	0 - 43

Local (Critical) Thresholds: any of these factors will significantly increase the risk for extreme fire behavior. The more factors present, the greater the risk.

Weather Observations (at the Critical Percentile)	LOW Elevation FDRA (84th percentile)	HIGH Elevation FDRA (80th percentile)
20-ft Wind (mph)	> 12	> 7
Min. Relative Humidity (%)	< 8	< 12
Max. Temperature (°F)	> 92	> 80

- Be cautious of a collapsing smoke column (especially when a fire is advancing toward the top of a plateau / mesa). This has resulted in fire shelter deployments (*Price Canyon Fire*) due to intense (50 mph) winds.
- Wind Gusts exceeding 25 mph for 3 or more consecutive hours is considered *Red Flag* criteria for this area when the RH is 15% or less.
- Microburst winds are powerful downdrafts from thunderstorms which can seriously affect a fire's intensity and direction from many miles away.



Past Fire Experience

LOW Elevation FDRA

Date	Fire Name	Size (ac)	BI	RH (%)	Temp (°F)	Wind (mph)
05/26/12	Cabin	20	161	10	79	31
06/01/02	Nizhoni	2,354	122	6	97	16
07/14/02	Hangdog	6,000	97	6	104	10

HIGH Elevation FDRA

Date	Fire Name	Size (ac)	BI	RH (%)	Temp (°F)	Wind (mph)
05/25/12	Sunrise Mine	5,742	100	9	63	15
06/20/02	Rattle Complex	93,835	92	11	81	9
06/26/12	Seeley	47,588	91	11	83	9
06/29/02	Price Canyon	3,200	80	6	86	4

Burning Index (BI) Facts:

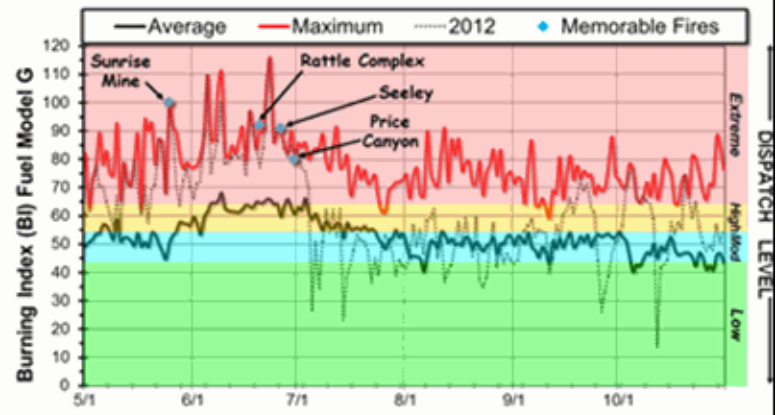
- BI is an index representing the potential difficulty containing a fire due to flame length (intensity) at the head of the fire
- BI is very sensitive to small fluctuations in wind speed
- BI with Fuel Model G has a very good statistical correlation to large fire occurrence in the Moab interagency dispatch area.

Updated: May 2013

Moab HIGH Elevation FDRA

RAWS (in SIG)	Number	Elevation	Data Years	FWZ	Model
Joes Valley *	421602	8700'	1999 - 2012	488	7G
Bruin Point *	420912	9700'	1999 - 2012	484	7G
North Long Point *	422710	8680'	1999 - 2012	491	7G
Carpenter Ridge *	053808	8188'	1999 - 2012	290	7G

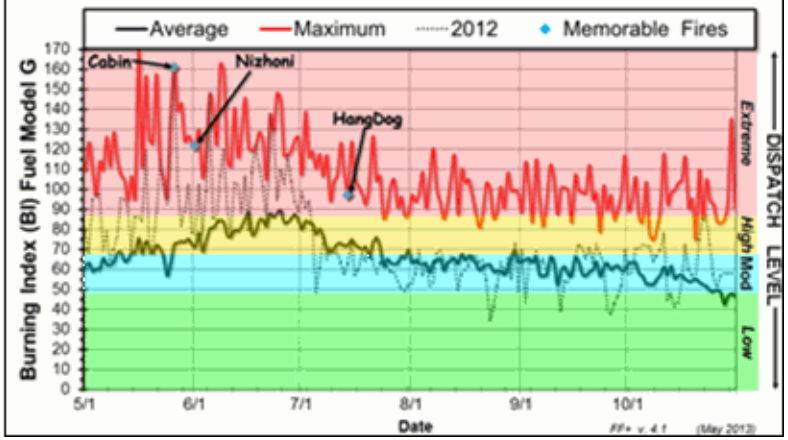
** These stations comply with NWCG Weather Station Standards (PMS 426-3)*



Moab LOW Elevation FDRA

RAWS (in SIG)	Number	Elevation	Data Years	FWZ	Model
Flattop *	422002	6120'	1991 - 2012	489	7G
Bryson *	422102	5320'	1991 - 2012	490	7G
Big Indian *	422711	6960'	1991 - 2012	491	7G
Kane Gulch *	422712	6500'	1991 - 2012	491	7G

** These stations comply with NWCG Weather Station Standards (PMS 426-3)*



Energy Release Component (Fuel Model G)

Fire Danger PocketCard

Moab Interagency Fire Center

http://fam.nwcg.gov/fam-web/pocketcards/

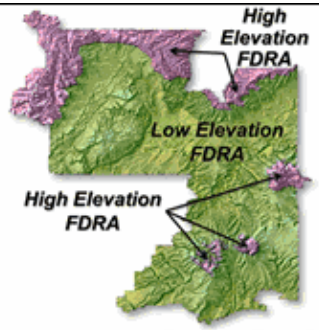
Fire Danger Interpretation

		ERC - Model G	
		LOW Elevation	HIGH Elevation
V	Extreme	92 +	84 +
IV	Very High	80 - 91	70 - 83
III	High	66 - 79	57 - 69
II	Moderate	51 - 65	41 - 56
I	Low	0 - 50	0 - 40

Local (Critical) Thresholds: any of these factors will significantly increase the risk for extreme fire behavior. The more factors present, the greater the risk.

Weather Observations (at the Critical Percentile)	LOW Elevation FDRA (84th percentile)	HIGH Elevation FDRA (80th percentile)
20-ft Wind (mph)	> 12	> 7
Min. Relative Humidity (%)	< 8	< 12
Max. Temperature (°F)	> 92	> 80

- Be cautious of a collapsing smoke column (especially when a fire is advancing toward the top of a plateau / mesa). This has resulted in fire shelter deployments (*Price Canyon Fire*) due to intense (50 mph) winds.
- Wind Gusts exceeding 25 mph for 3 or more consecutive hours is considered *Red Flag* criteria for this area when the RH is 15% or less.
- Microburst winds are powerful downdrafts from thunderstorms which can seriously affect a fire's intensity and direction from many miles away.



Past Fire Experience

LOW Elevation FDRA

Date	Fire Name	Size (ac)	ERC	RH (%)	Temp (°F)	Wind (mph)
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06/01/02	Nizhoni	2,354	101	6	97	16
07/14/02	Hangdog	6,000	107	6	104	10

HIGH Elevation FDRA

Date	Fire Name	Size (ac)	ERC	RH (%)	Temp (°F)	Wind (mph)
05/25/12	Sunrise Mine	5,742	84	9	63	15
06/20/02	Rattle Complex	93,835	105	11	81	9
06/26/12	Seeley	47,588	102	11	83	9
06/29/02	Price Canyon	3,200	104	6	86	4

Energy Release Component (ERC) Facts:

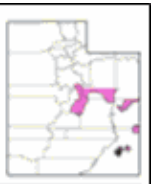
- ERC relates to the amount of fuel available to burn, thus the load and dryness of fuel are used in the calculations.
- ERC is not influenced by wind or topography (slope).
- ERC trends can exhibit good characterization of the fire season.
- An ERC calculation considers the past 7 days when calculating a new ERC.

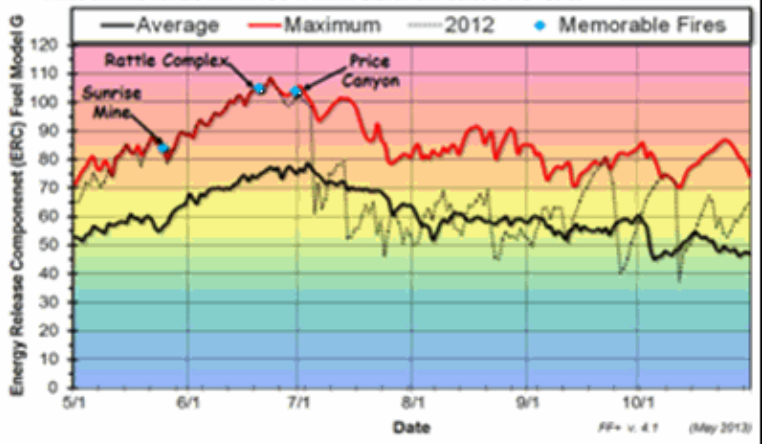
Updated: May 2013

Moab HIGH Elevation FDRA

RAWS (in SIG)	Number	Elevation	Data Years	FWZ	Model
Joes Valley *	421602	8700'	1999 - 2012	488	7G
Bruin Point *	420912	9700'	1999 - 2012	484	7G
North Long Point *	422710	8680'	1999 - 2012	491	7G
Carpenter Ridge *	053808	8188'	1999 - 2012	290	7G

* These stations comply with NWCG Weather Station Standards (PMS 426-3)

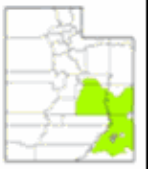


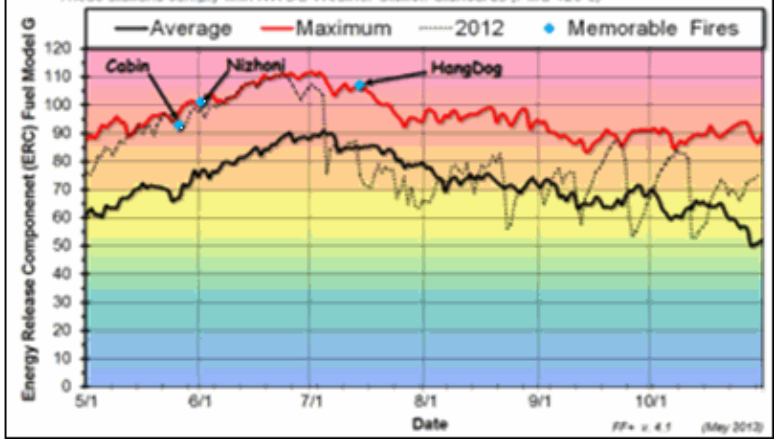


Moab LOW Elevation FDRA

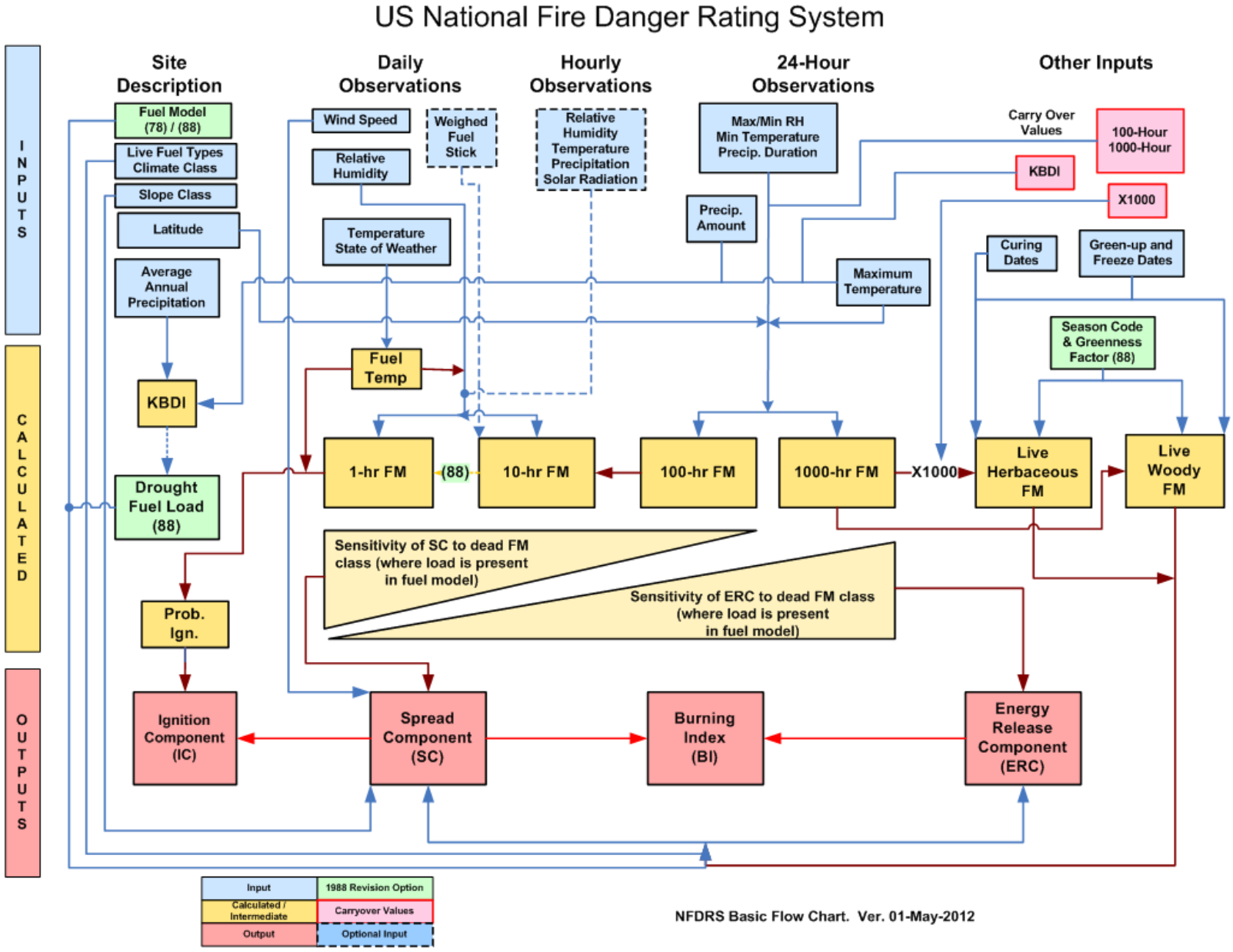
RAWS (in SIG)	Number	Elevation	Data Years	FWZ	Model
Flattop *	422002	6120'	1991 - 2012	489	7G
Bryson *	422102	5320'	1991 - 2012	490	7G
Big Indian *	422711	6960'	1991 - 2012	491	7G
Kane Gulch *	422712	6500'	1991 - 2012	491	7G

* These stations comply with NWCG Weather Station Standards (PMS 426-3)

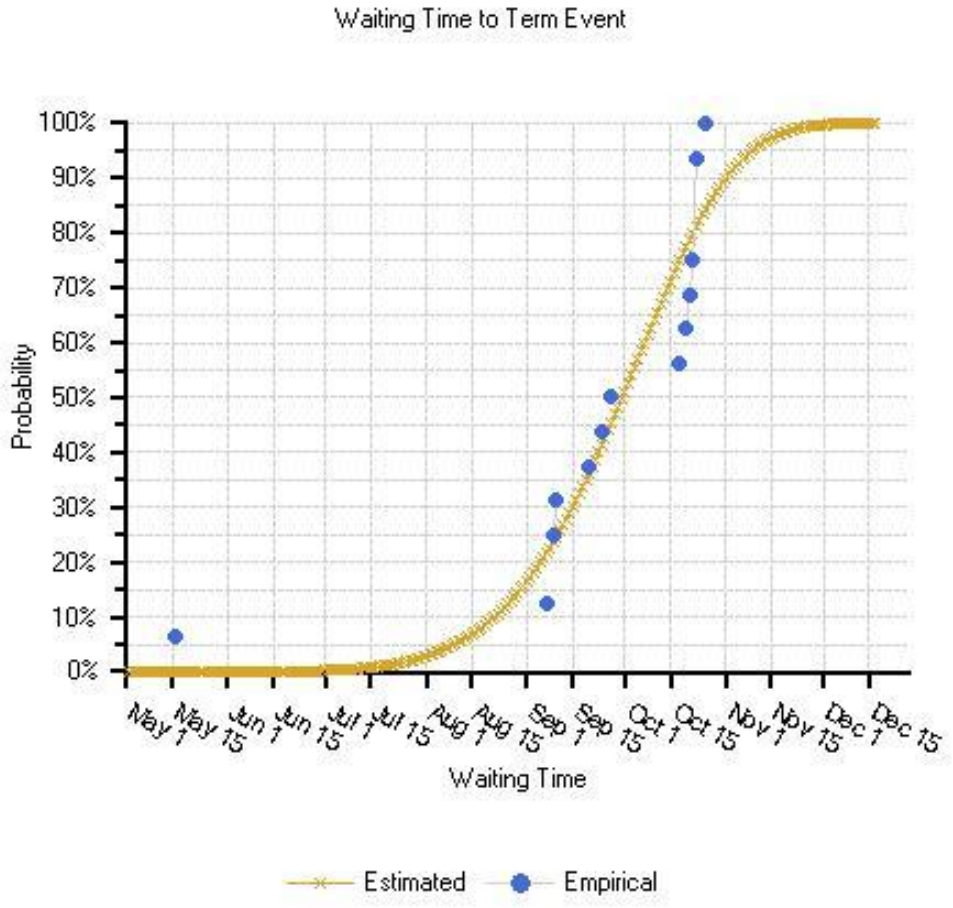




Appendix I – NFDRS Structure Chart

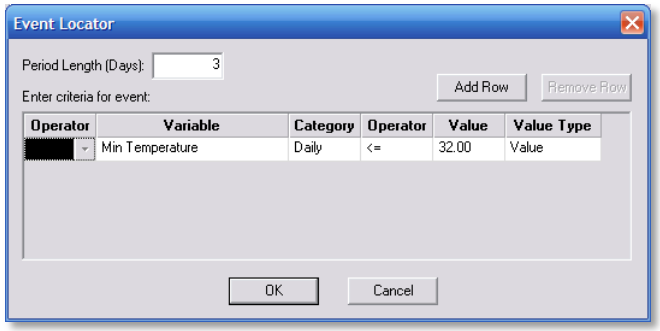


Appendix J – RERAP Analysis (Season-Ending Event Probabilities)



RERAP Analysis (Season-Ending Event Probabilities)

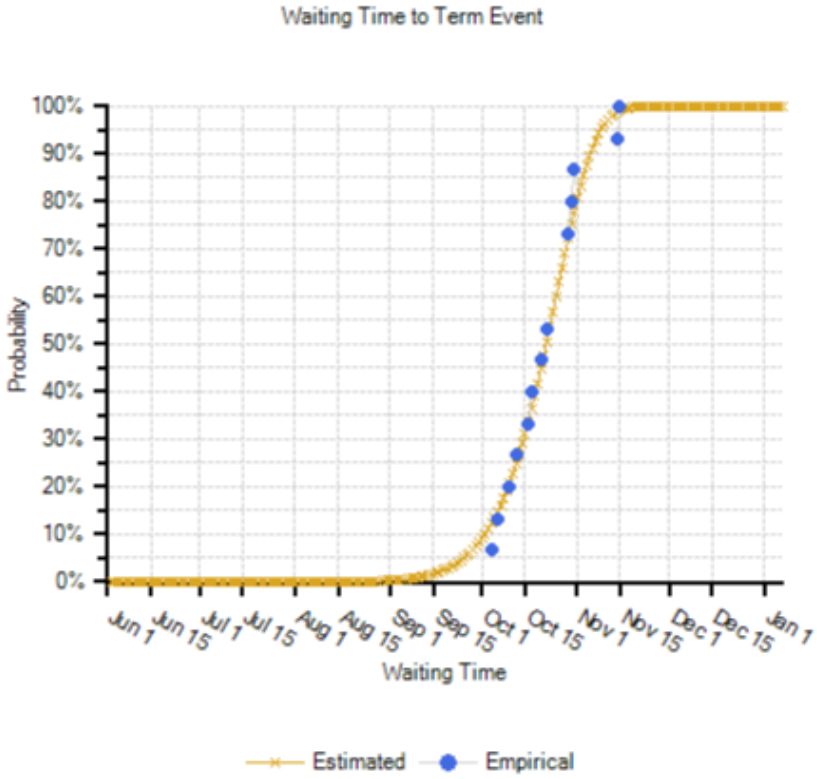
High Elevation FDRA



Term Report

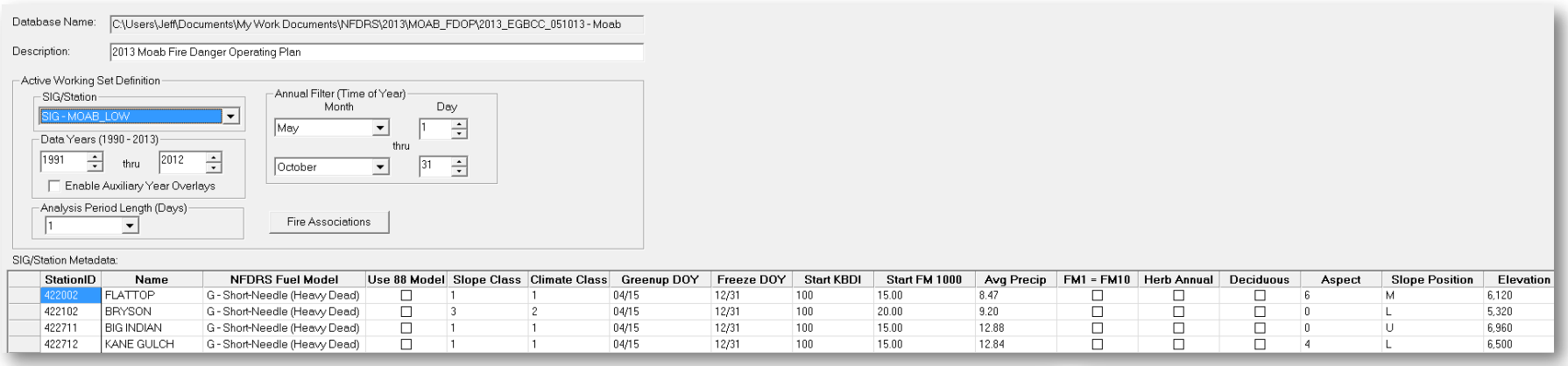
Season Start Date:	6/1
Alpha Value:	12.5
Beta Value:	0.0068
R Squared:	0.98
File name:	Wasatch.trm

Date	# days
10/29/1994	150
10/22/1995	143
10/20/1996	141
10/12/1997	133
10/4/1998	125
10/16/1999	137
10/31/2000	152
11/14/2001	166
10/29/2002	150
10/30/2003	151
10/29/2004	150
11/15/2005	167
10/17/2006	138
10/6/2007	127
10/10/2008	131

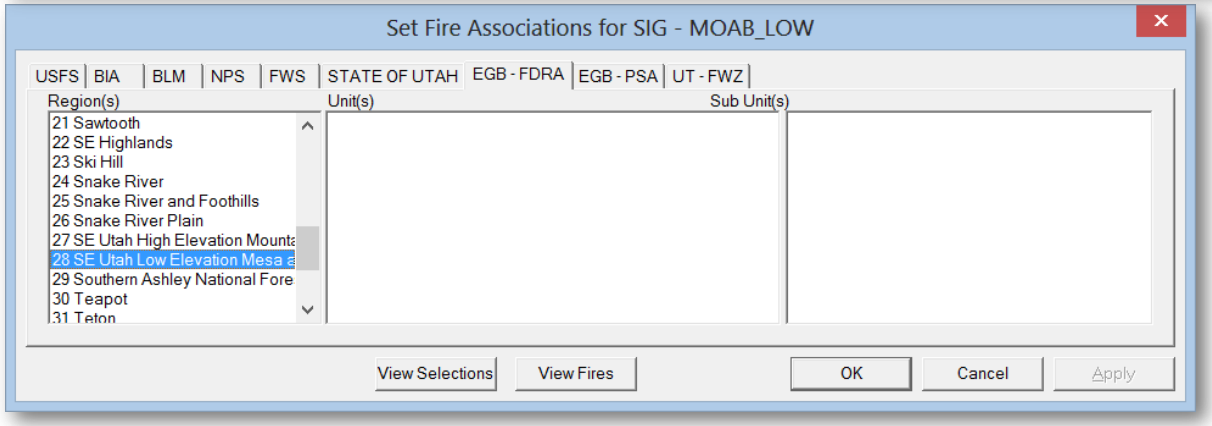


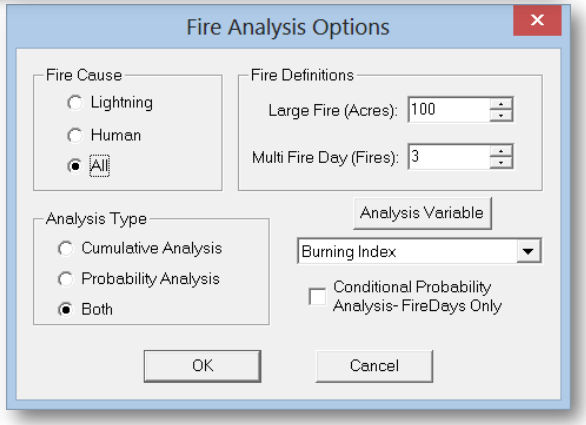
Appendix K – FireFamilyPlus Analysis

Working Set (Low Elevation FDRA)

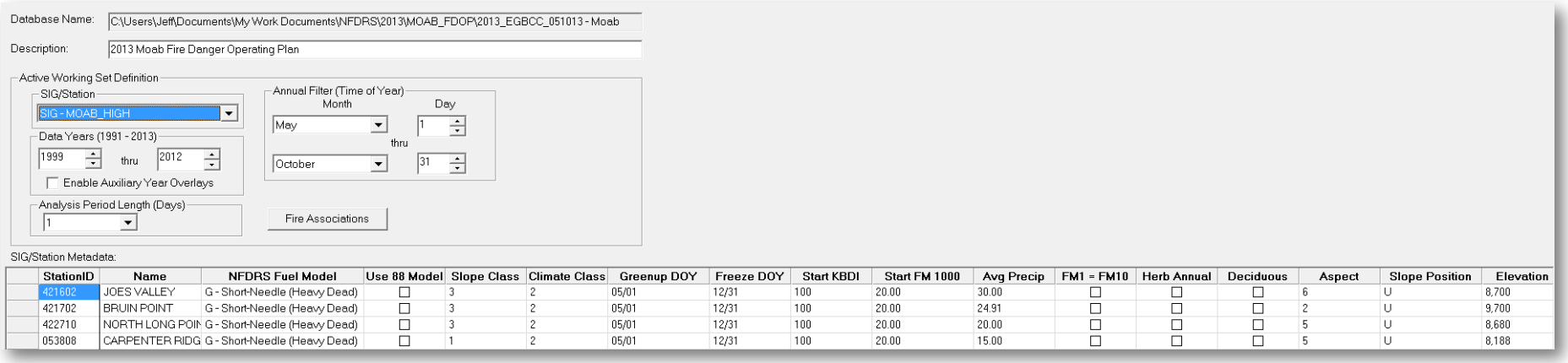


StationID	Name	NFDRS Fuel Model	Use 88 Model	Slope Class	Climate Class	Greenup DOY	Freeze DOY	Start KBDI	Start FM 1000	Avg Precip	FM1 = FM10	Herb Annual	Deciduous	Aspect	Slope Position	Elevation
422002	FLATTOP	G - Short-Needle (Heavy Dead)	☐	1	1	04/15	12/31	100	15.00	8.47	☐	☐	☐	6	M	6,120
422102	BRYSON	G - Short-Needle (Heavy Dead)	☐	3	2	04/15	12/31	100	20.00	9.20	☐	☐	☐	0	L	5,320
422711	BIG INDIAN	G - Short-Needle (Heavy Dead)	☐	1	1	04/15	12/31	100	15.00	12.88	☐	☐	☐	0	U	6,960
422712	KANE GULCH	G - Short-Needle (Heavy Dead)	☐	1	1	04/15	12/31	100	15.00	12.84	☐	☐	☐	4	L	6,500

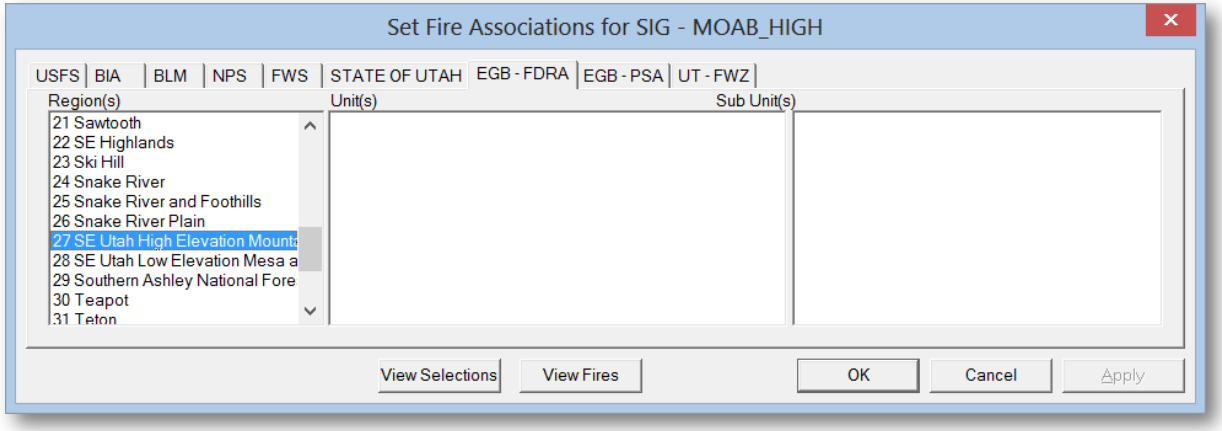


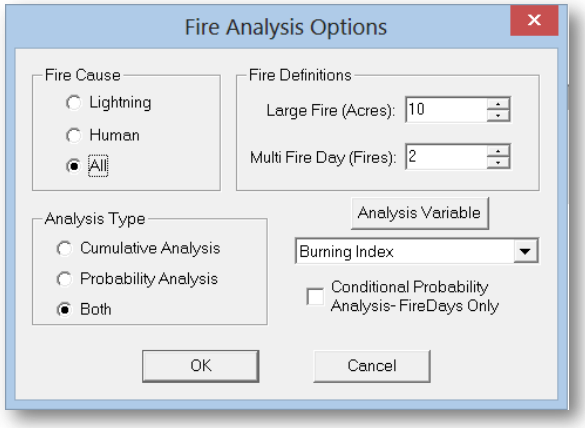


Working Set (Low Elevation FDRA)

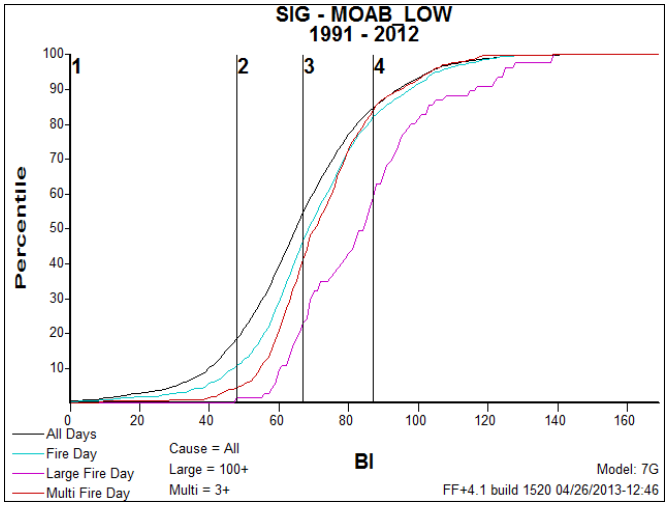


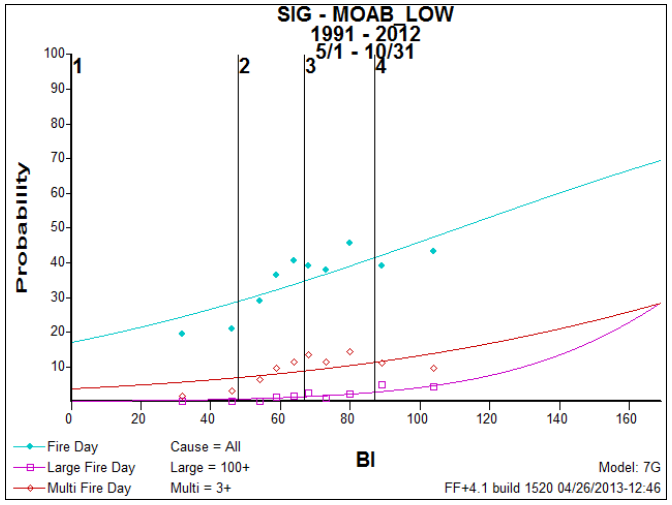
StationID	Name	NFDRS Fuel Model	Use 88 Model	Slope Class	Climate Class	Greenup DOY	Freeze DOY	Start KBDI	Start FM 1000	Avg Precip	FM1 = FM10	Herb Annual	Deciduous	Aspect	Slope Position	Elevation
421602	JOES VALLEY	G - Short-Needle (Heavy Dead)	☐	3	2	05/01	12/31	100	20.00	30.00	☐	☐	☐	6	U	8,700
421702	BRUIN POINT	G - Short-Needle (Heavy Dead)	☐	3	2	05/01	12/31	100	20.00	24.91	☐	☐	☐	2	U	9,700
422710	NORTH LONG POI	G - Short-Needle (Heavy Dead)	☐	3	2	05/01	12/31	100	20.00	20.00	☐	☐	☐	5	U	8,680
053808	CARPENTER RIDG	G - Short-Needle (Heavy Dead)	☐	1	2	05/01	12/31	100	20.00	15.00	☐	☐	☐	5	U	8,188

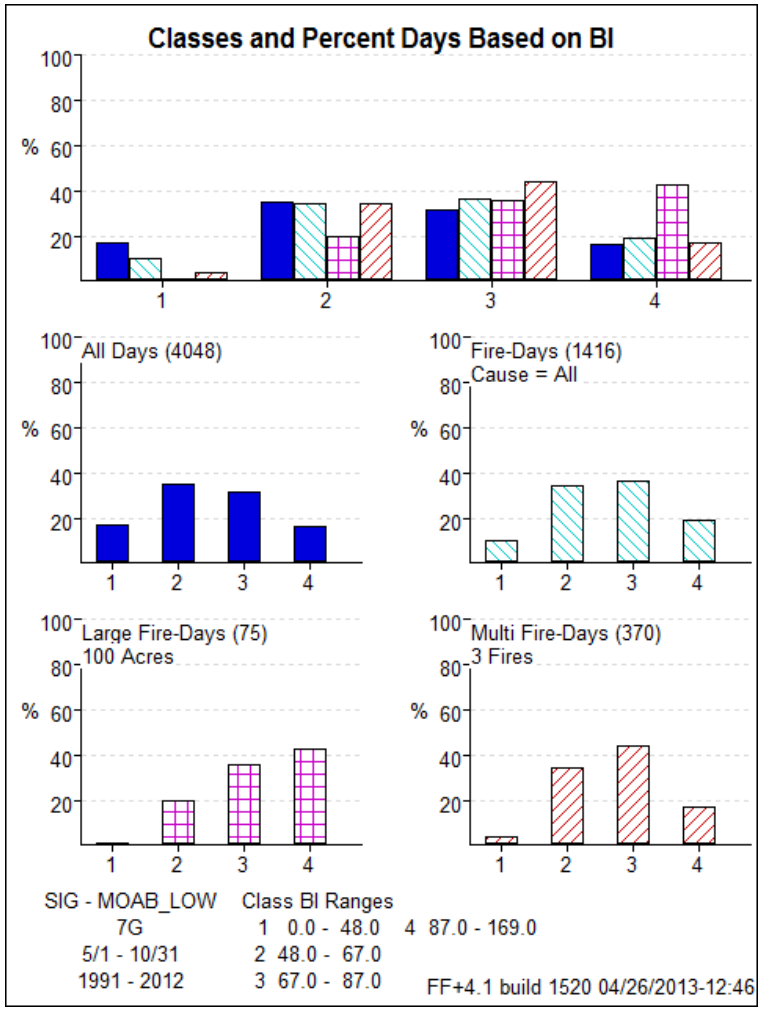


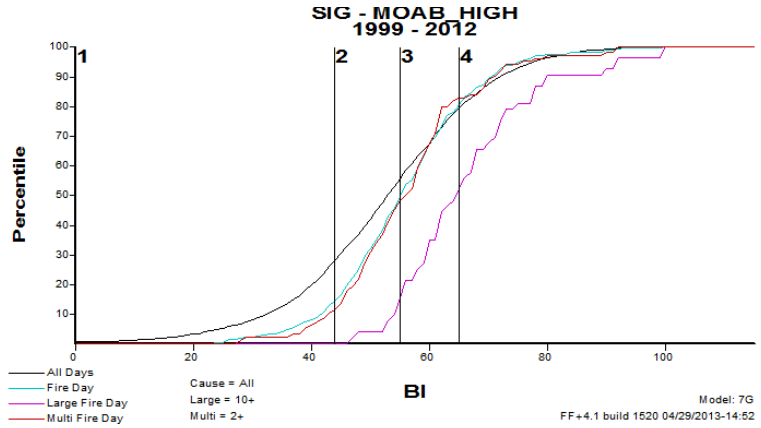


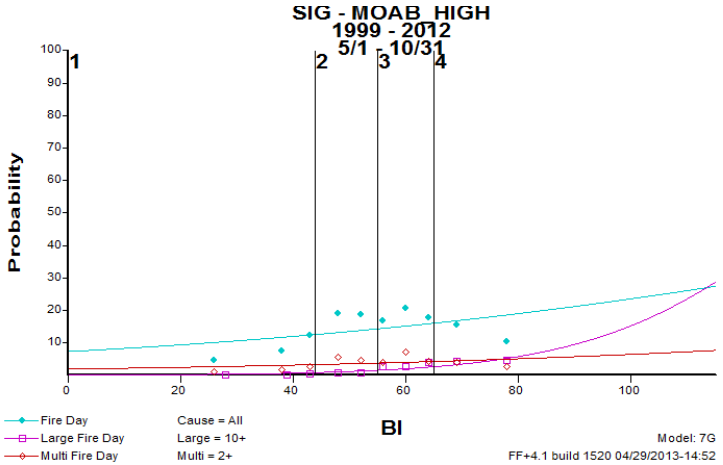
Dispatch Level Decision Points (Low Elevation FDRA)

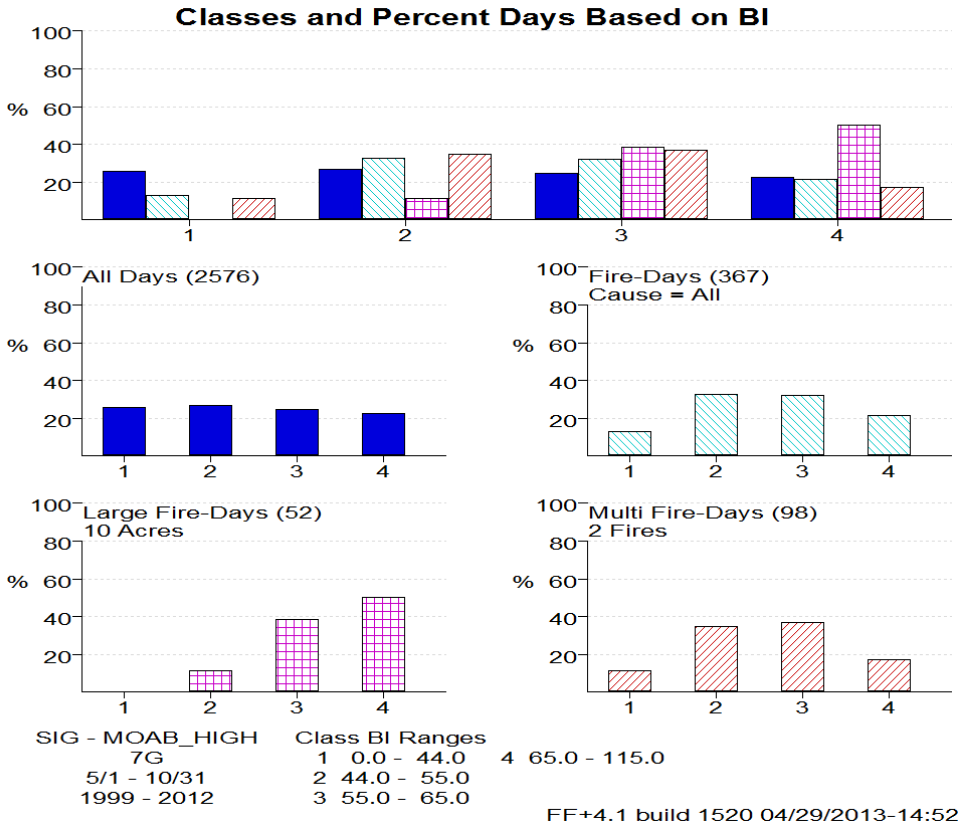




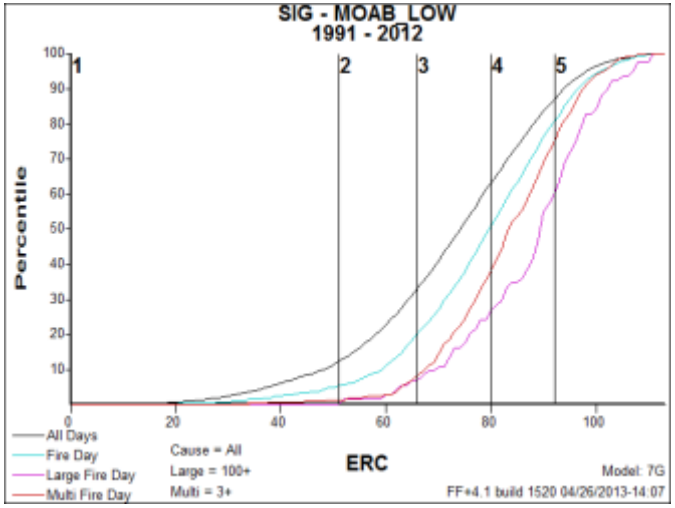


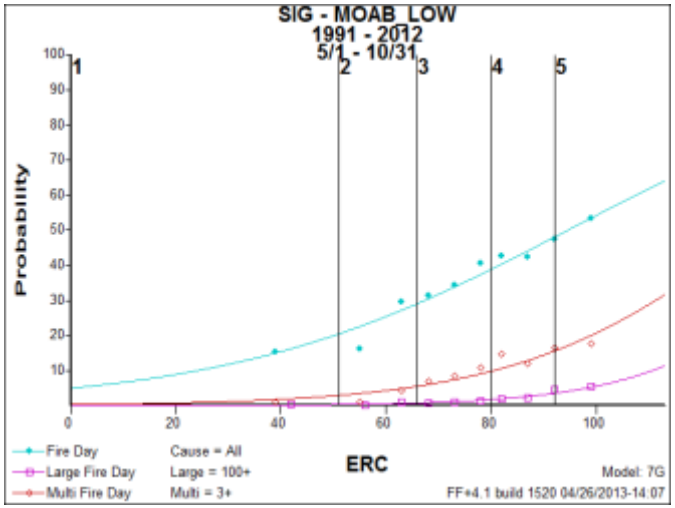

SIG - MOAB_HIGH
1999 - 2012
Percentile
BI
All Days
Fire Day
Large Fire Day
Multi Fire Day
Cause = All
Large = 10+
Multi = 2+
Model: 7G
FF+4.1 build 1520 04/29/2013-14:52

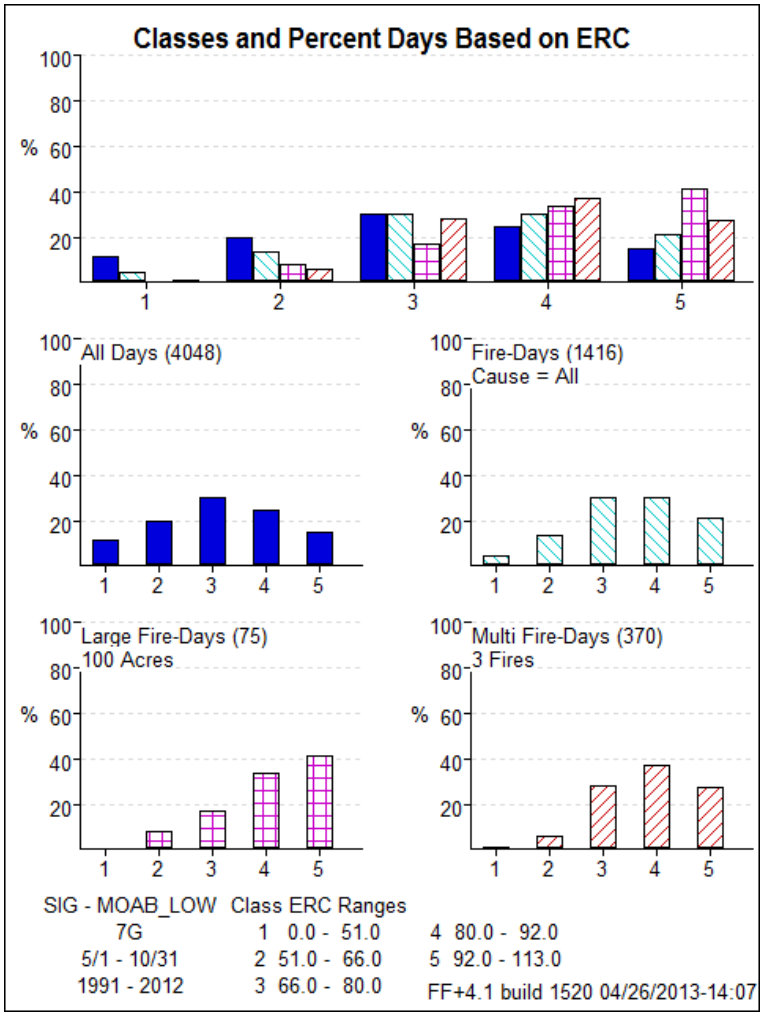

SIG - MOAB_HIGH
1999 - 2012
5/1 - 10/31
Probability
BI
Fire Day
Large Fire Day
Multi Fire Day
Cause = All
Large = 10+
Multi = 2+
Model: 7G
FF+4.1 build 1520 04/29/2013-14:52


Classes and Percent Days Based on BI
All Days (2576)
Fire-Days (367)
Cause = All
Large Fire-Days (52)
10 Acres
Multi Fire-Days (98)
2 Fires
SIG - MOAB_HIGH
7G
5/1 - 10/31
1999 - 2012
Class BI Ranges
1 0.0 - 44.0
2 44.0 - 55.0
3 55.0 - 65.0
4 65.0 - 115.0
FF+4.1 build 1520 04/29/2013-14:52

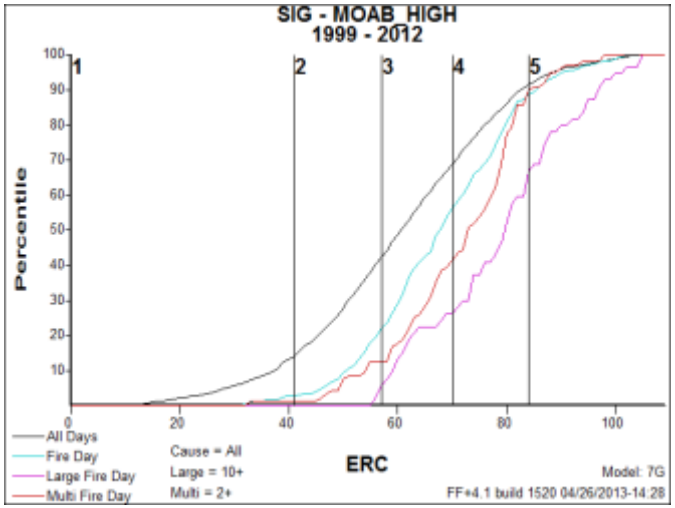
Preparedness Level Decision Points (Low Elevation FDRA)

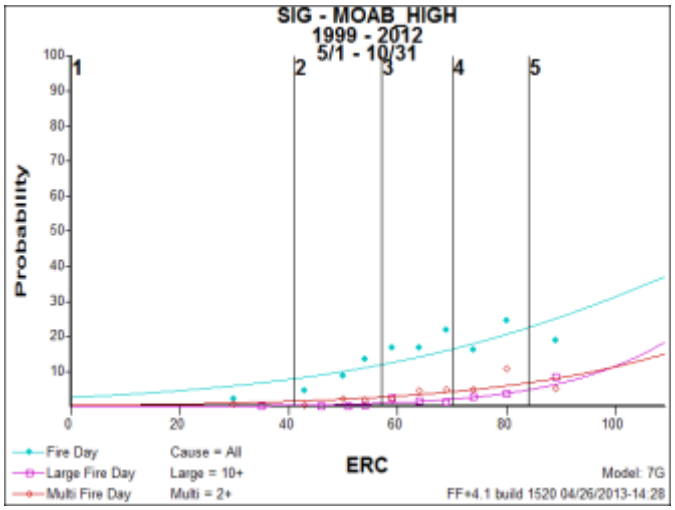


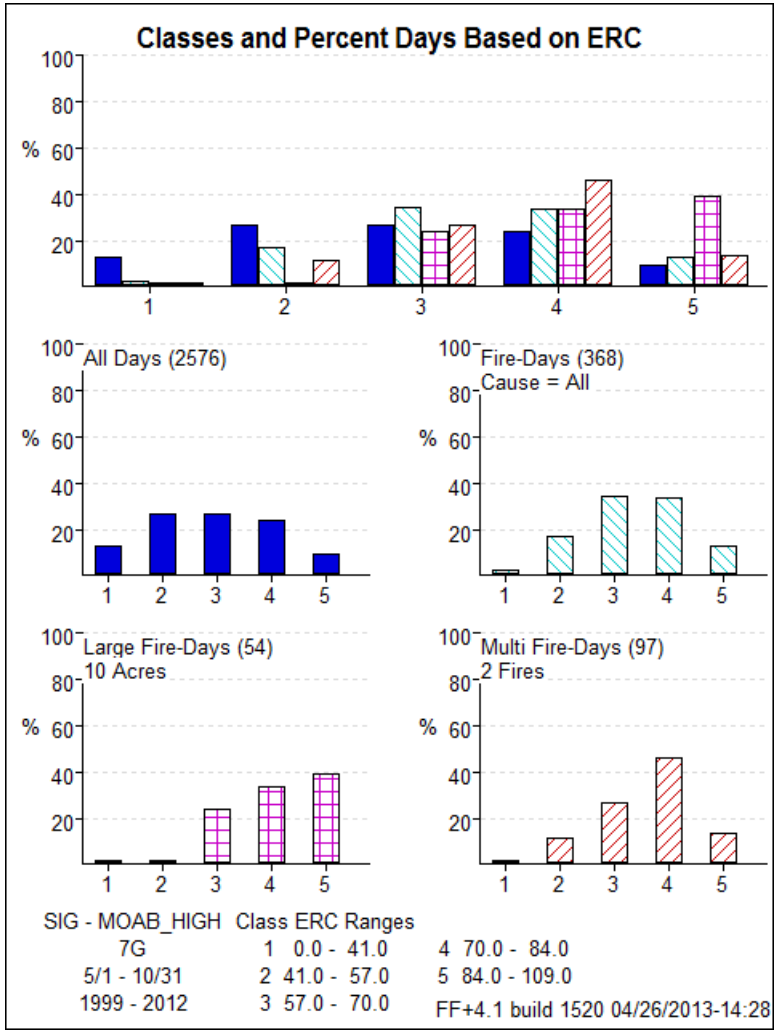




Preparedness Level Decision Points (High Elevation FDRA)

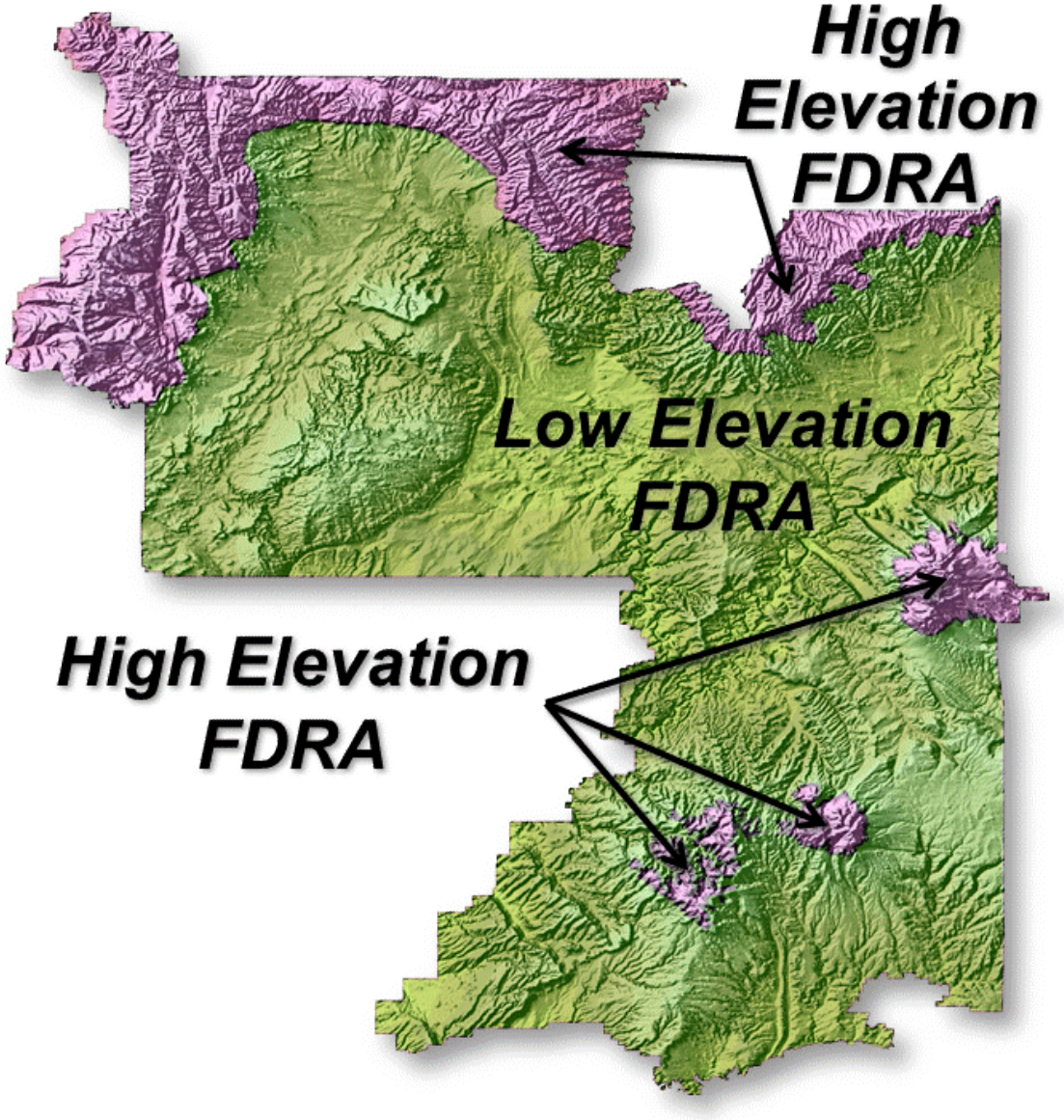




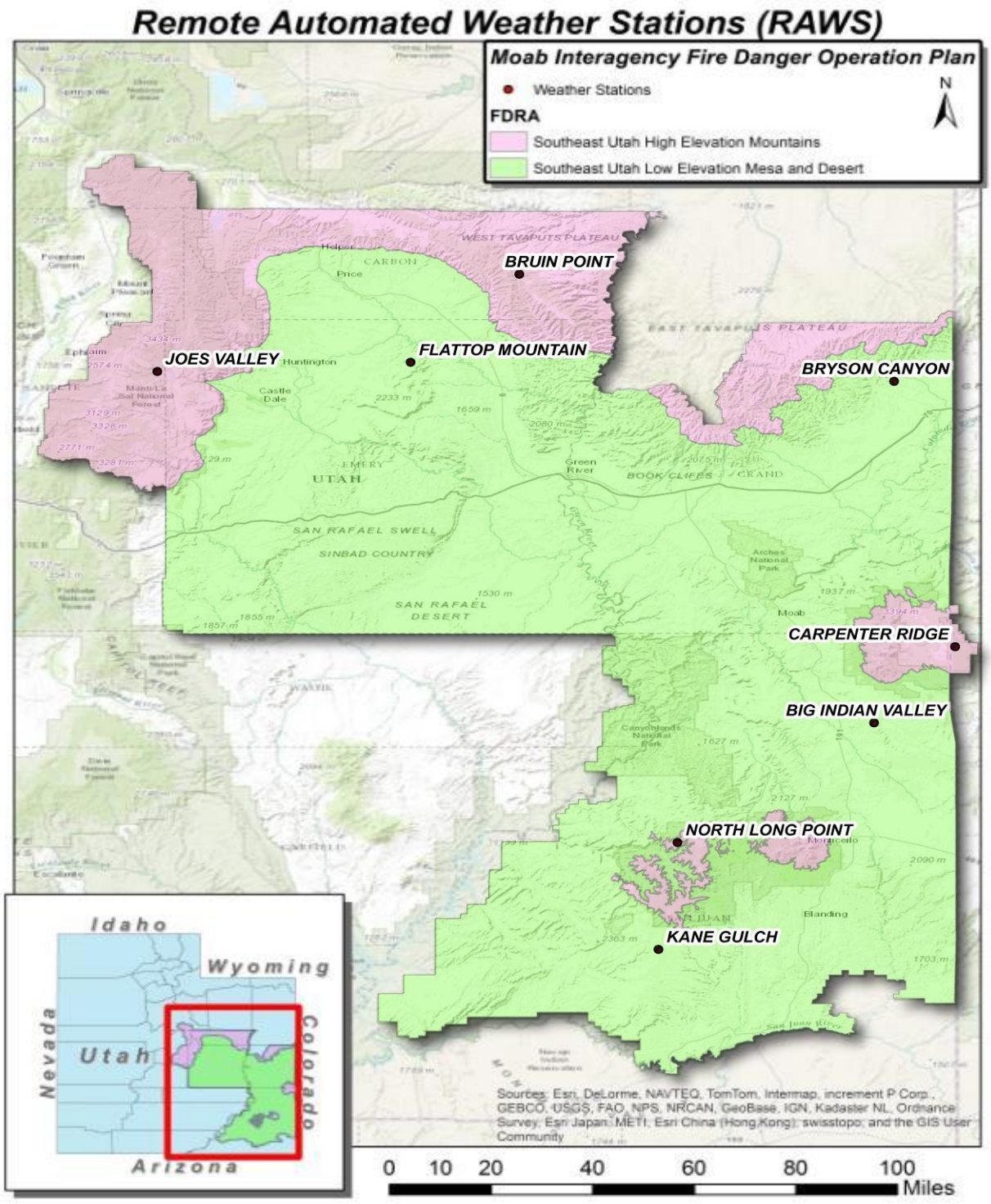


Appendix L – Maps

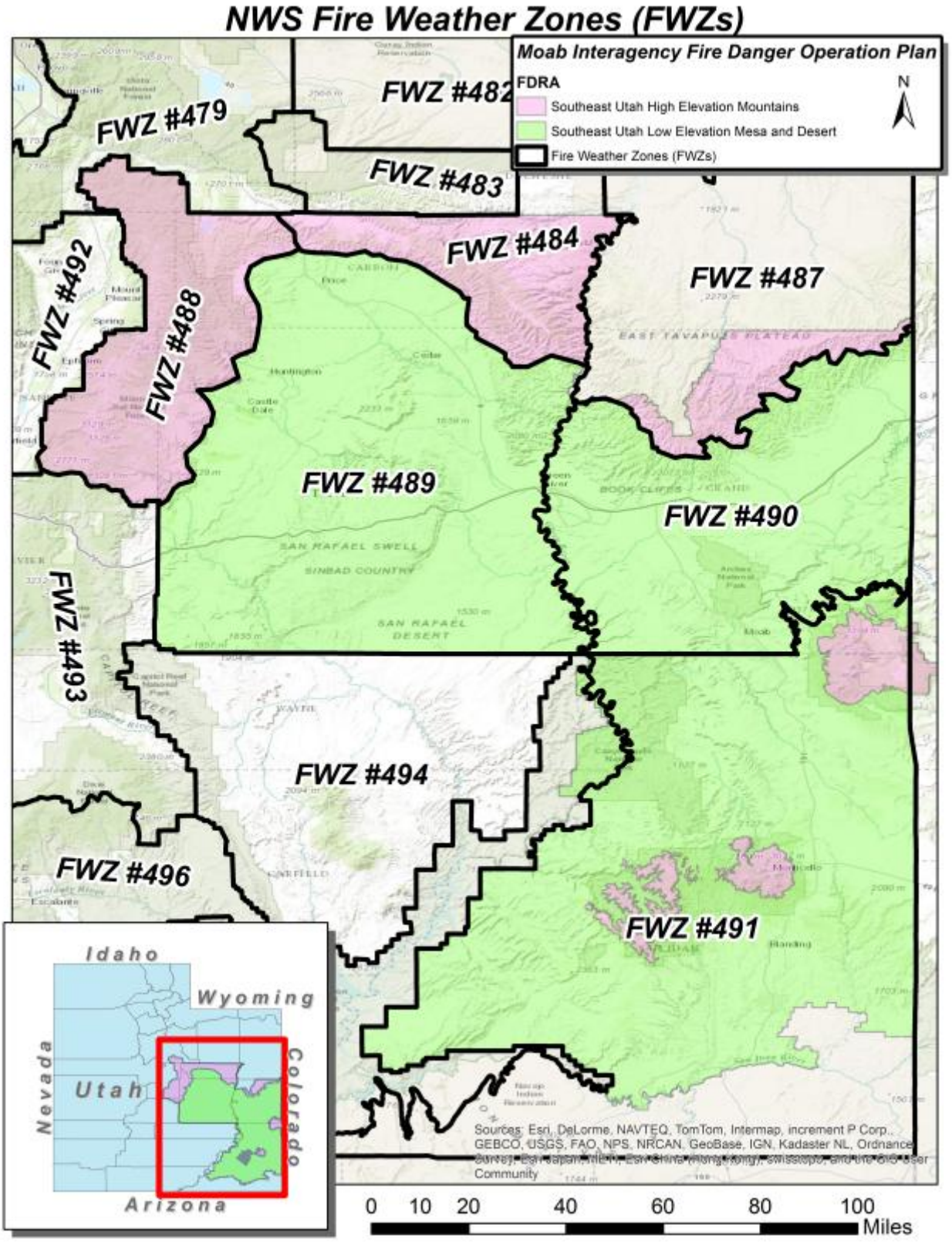
Fire Danger Rating Areas



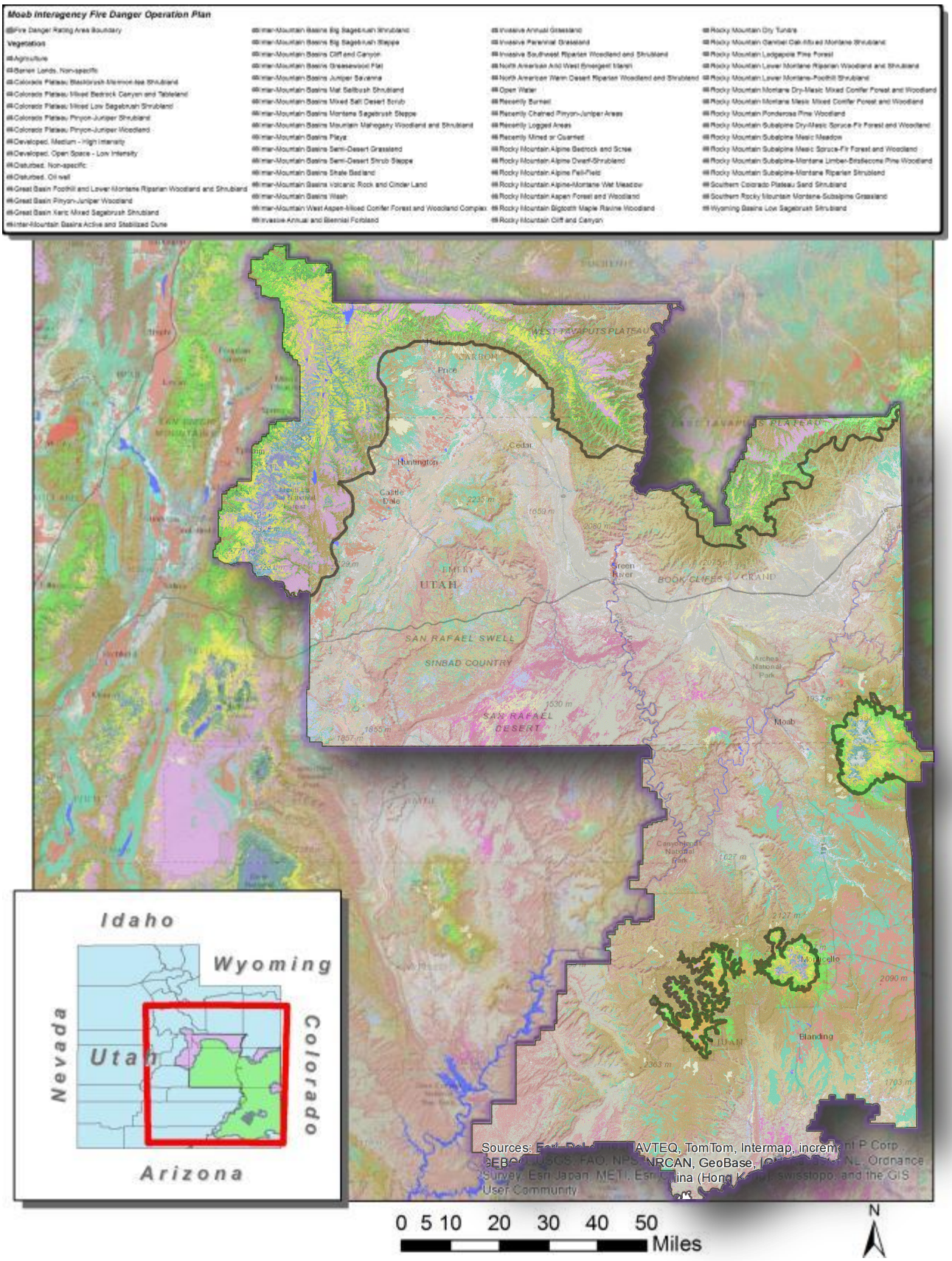
Remote Automated Weather Stations (RAWS)



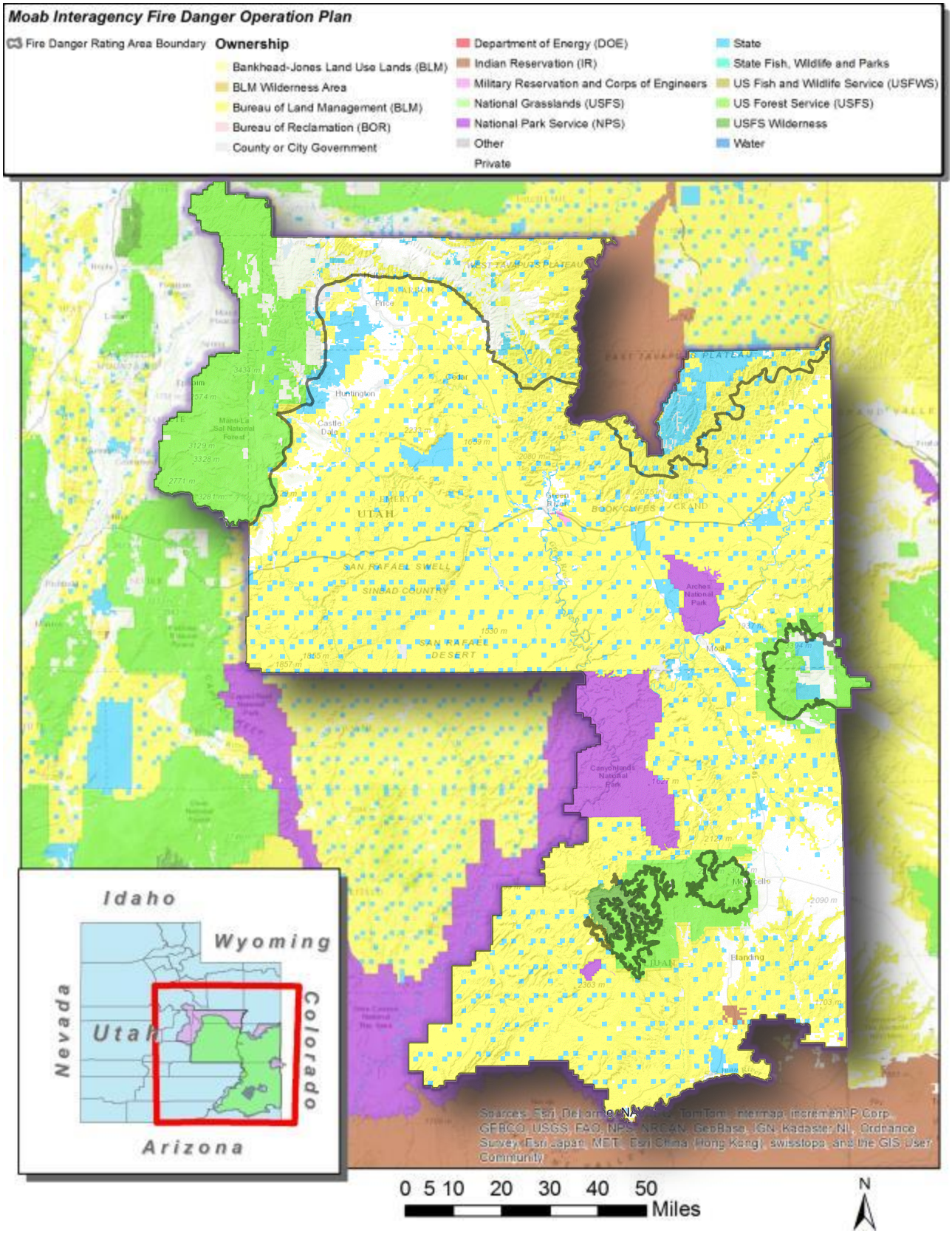
National Weather Service Fire Weather Zones



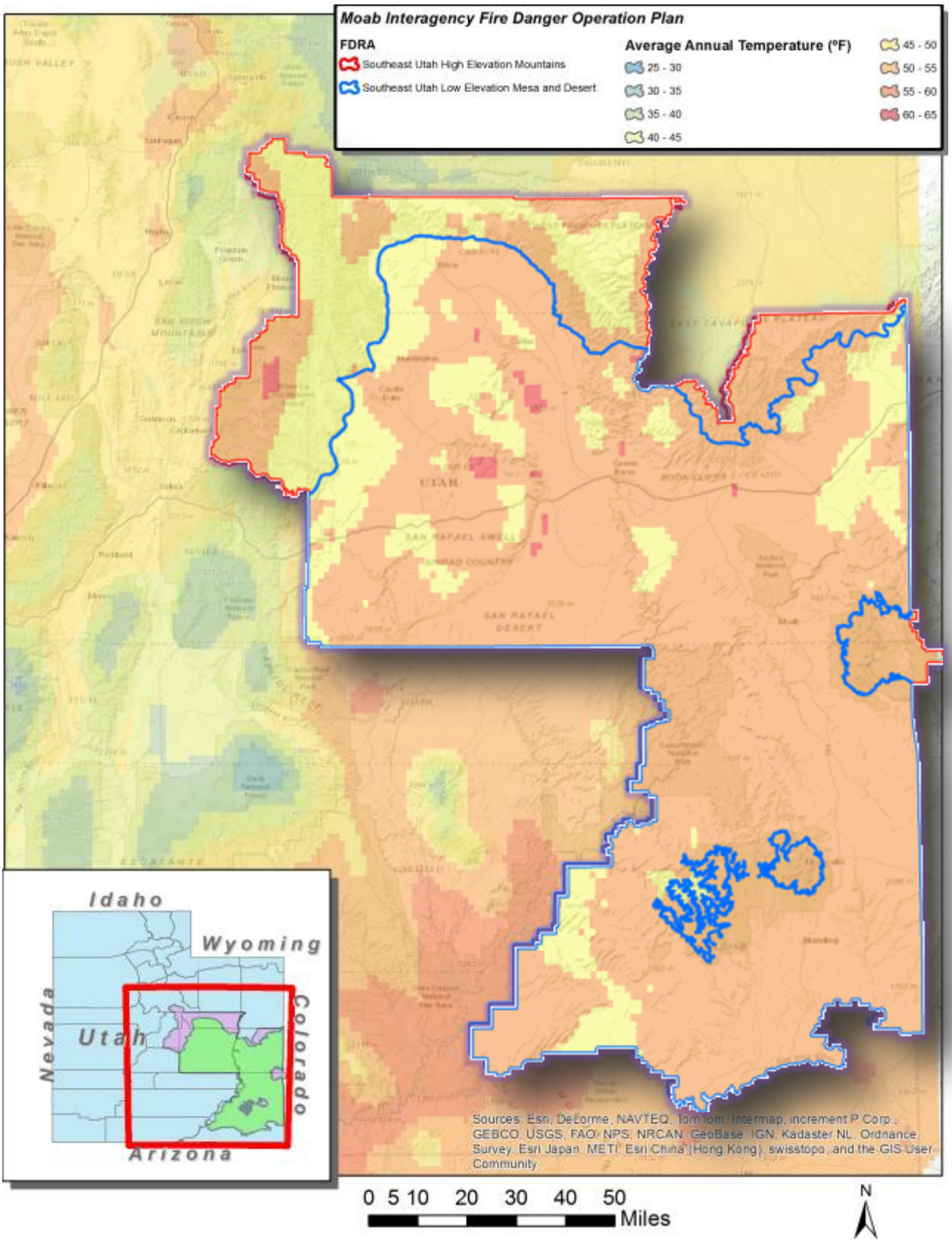
Vegetation (SWReGAP)



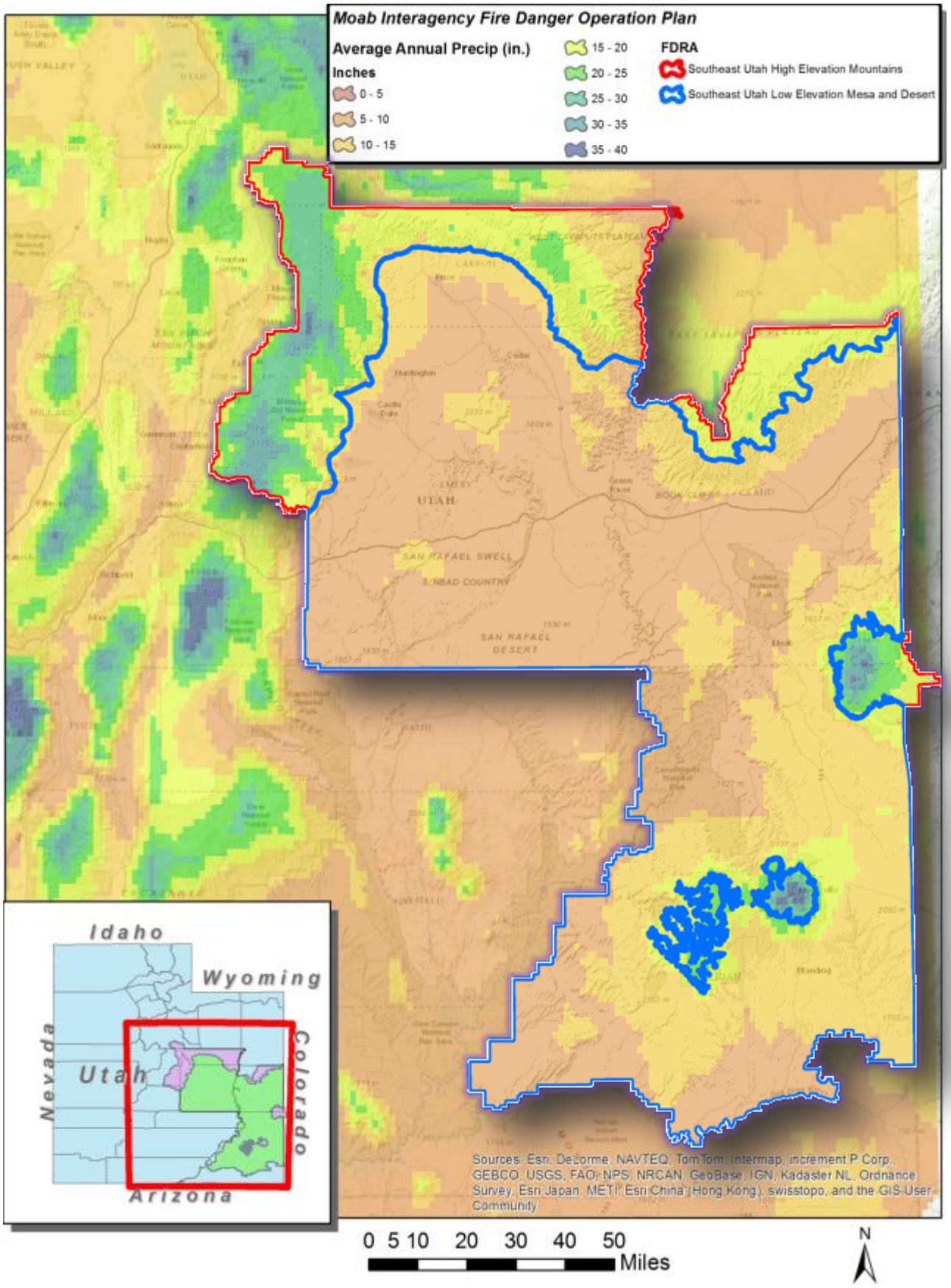
Ownership


Moab Interagency Fire Danger Operation Plan
Fire Danger Rating Area Boundary
Ownership
Bankhead-Jones Land Use Lands (BLM)
BLM Wilderness Area
Bureau of Land Management (BLM)
Bureau of Reclamation (BOR)
County or City Government
Department of Energy (DOE)
Indian Reservation (IR)
Military Reservation and Corps of Engineers
National Grasslands (USFS)
National Park Service (NPS)
Other
Private
State
State Fish, Wildlife and Parks
US Fish and Wildlife Service (USFWS)
US Forest Service (USFS)
USFS Wilderness
Water
Idaho
Wyoming
Nevada
Utah
Colorado
Arizona
0 5 10 20 30 40 50
Miles
N

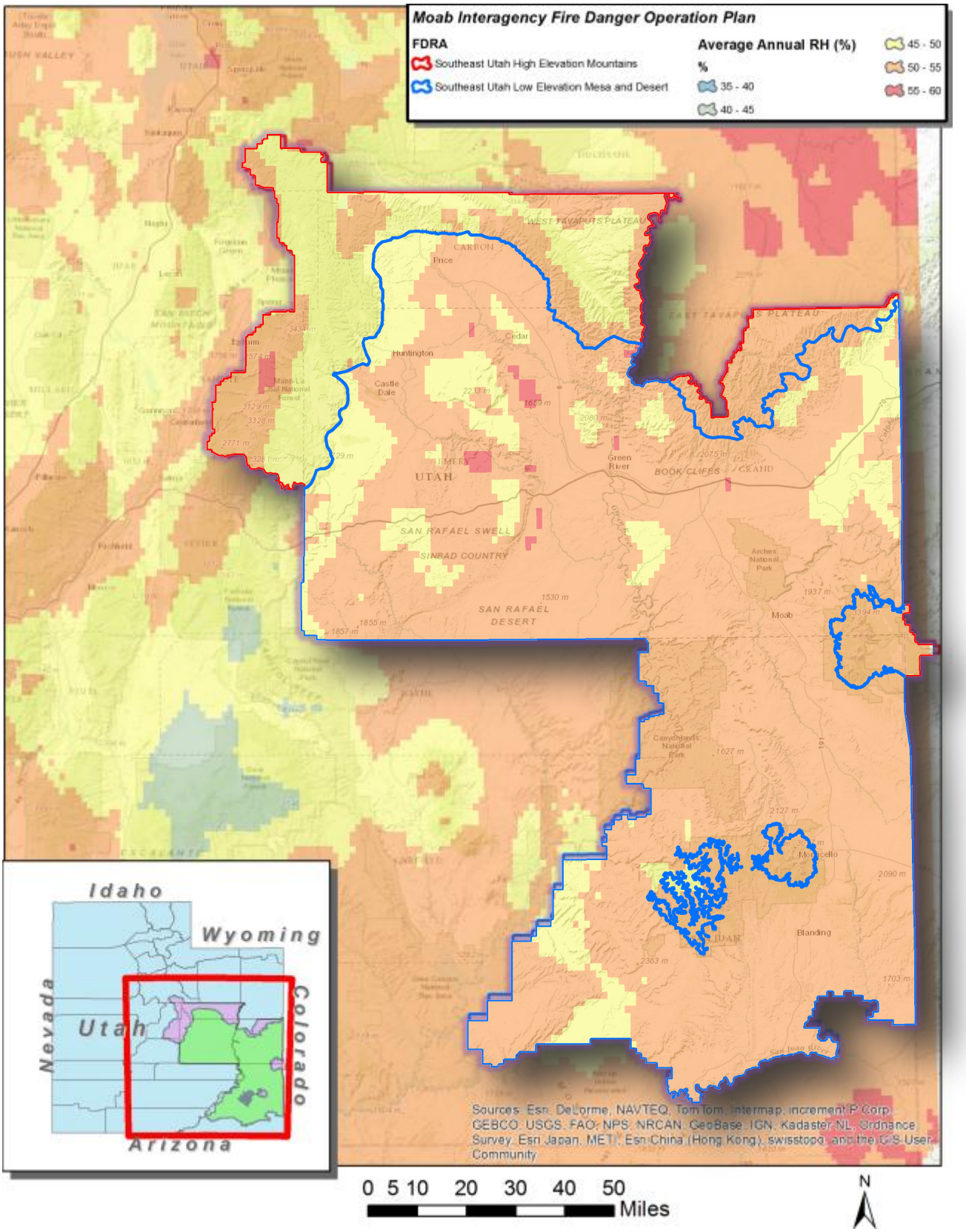
Climate – PRISM (Annual Average Temperature)



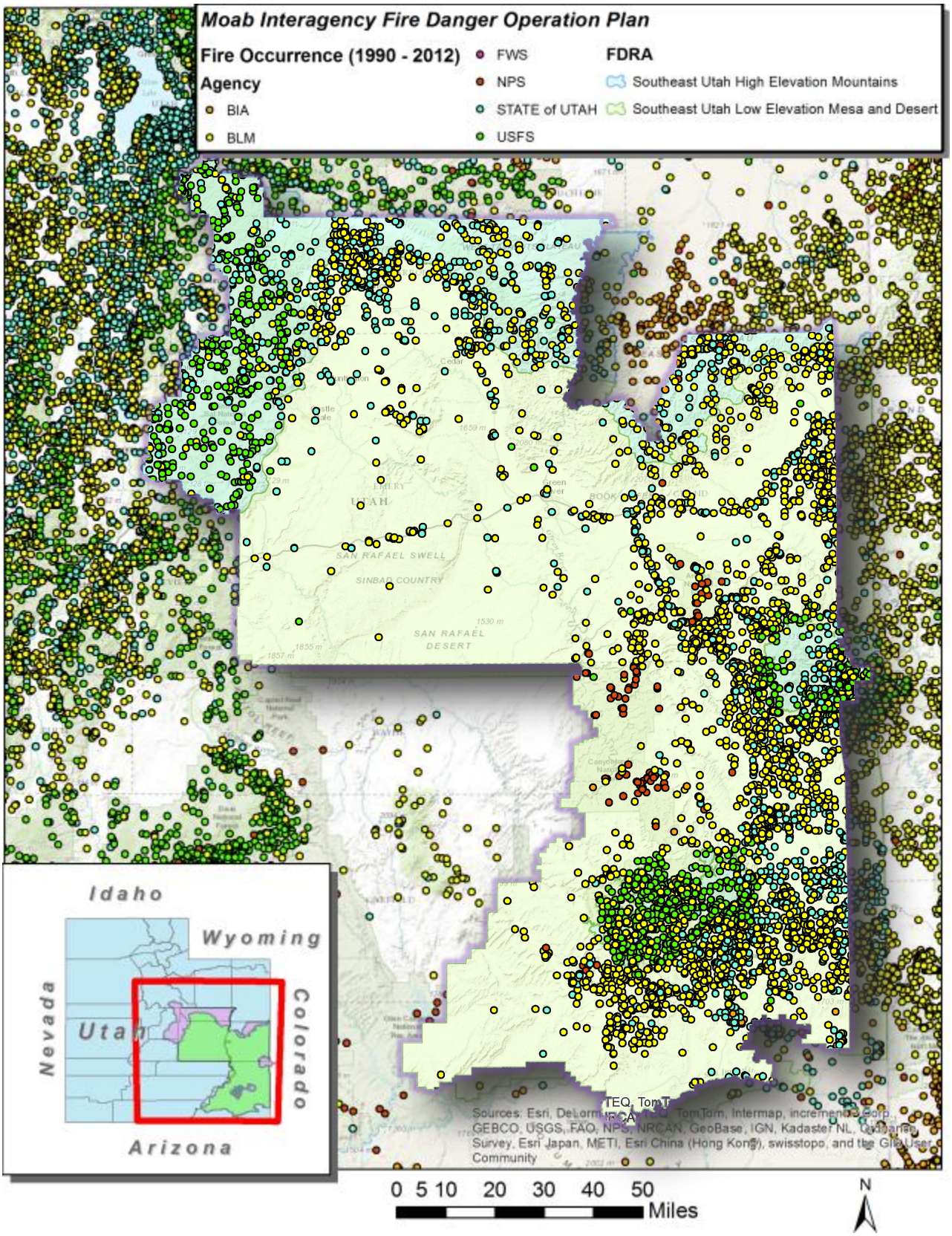
Climate – PRISM (Annual Average Precipitation)



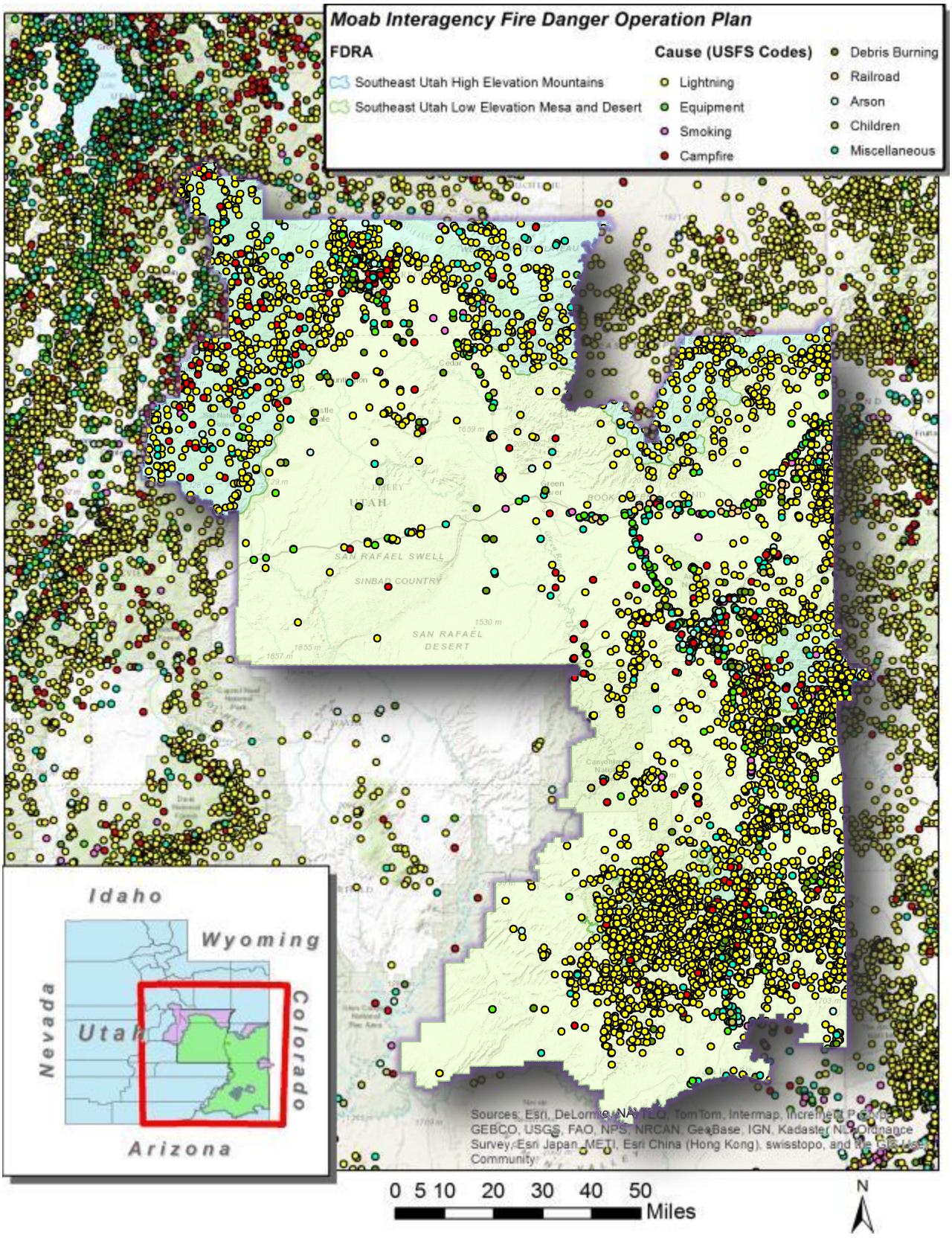
Climate – PRISM (Annual Average Relative Humidity)



Fire Occurrence (Point Location by Agency)



Fire Occurrence (Point Location by Cause)



Fire Occurrence (Large Fire Perimeters)